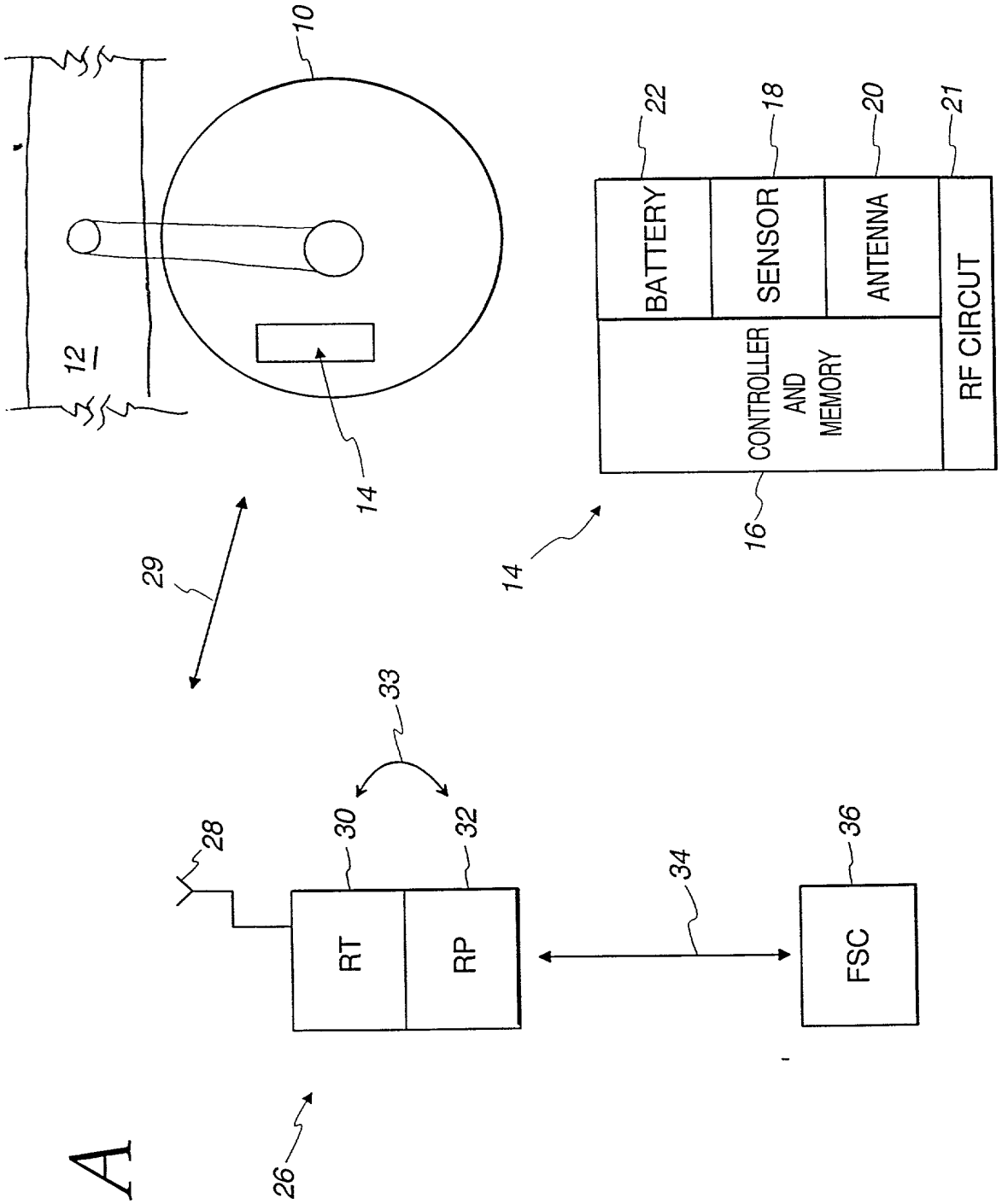
10
12
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21
BATTERY
SENSOR
ANTENNA
RF CIRCUT
CONTROLLER AND MEMORY
16
29
14
33
28
30
32
34
36
RT
RP
FSC
26

Fig. 1A

Fig 1B

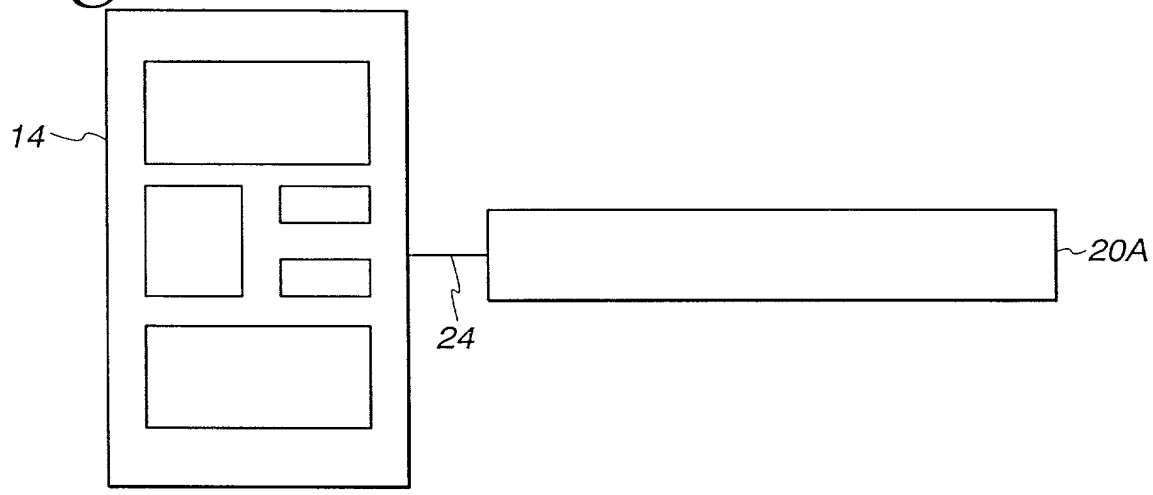



Fig 1C

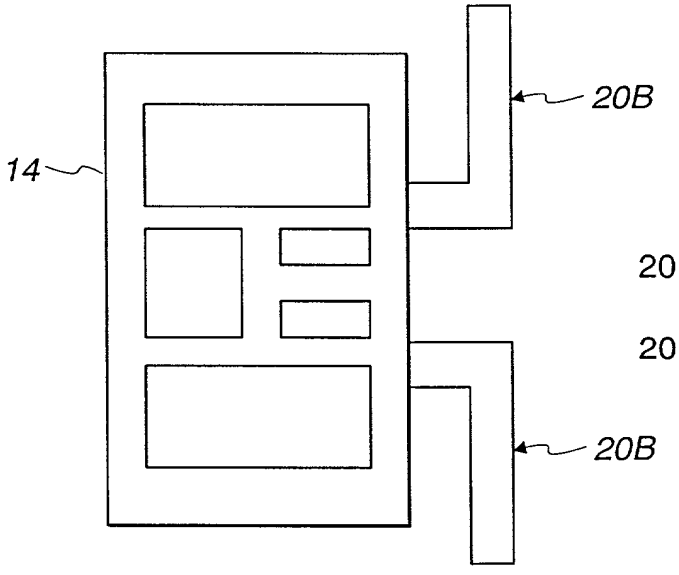
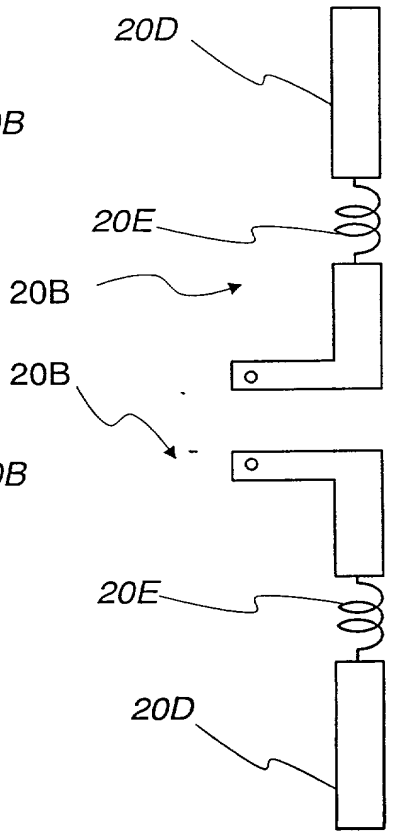



Fig 1D



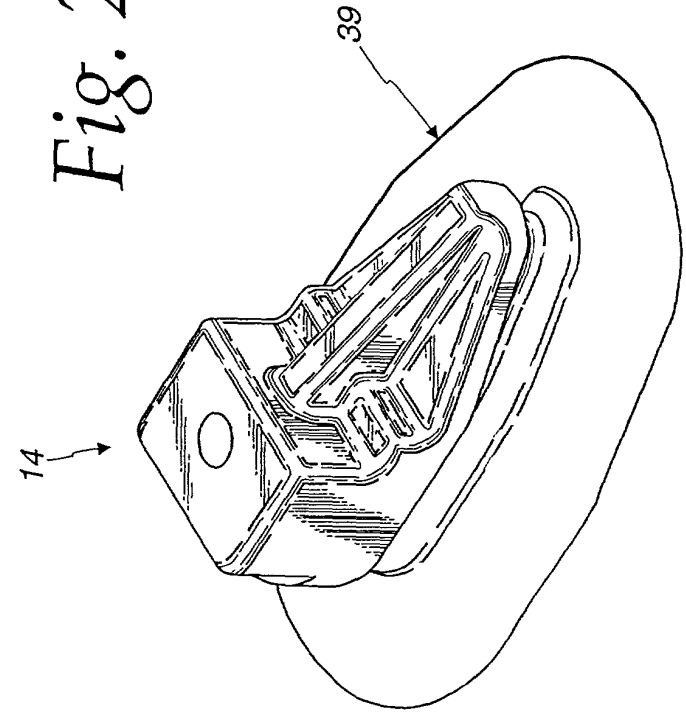



Fig. 2C

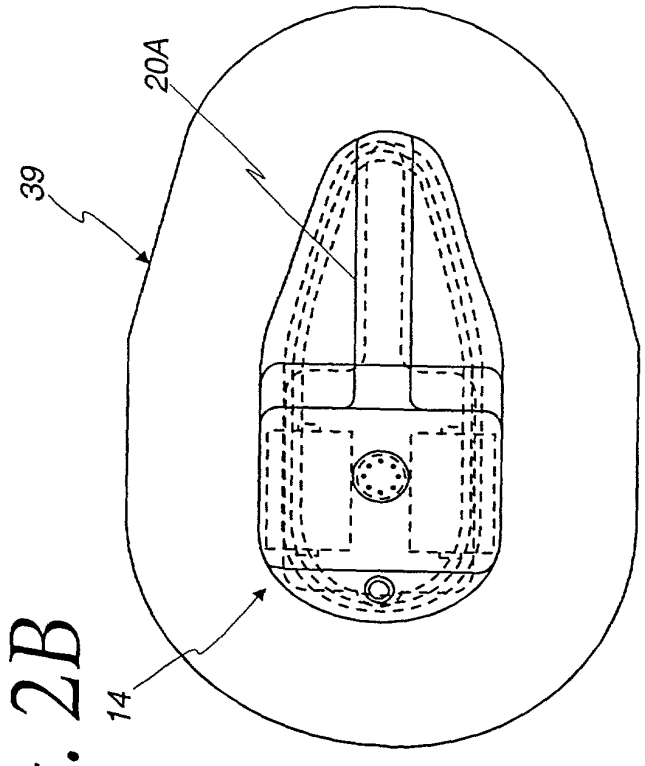



Fig. 2B

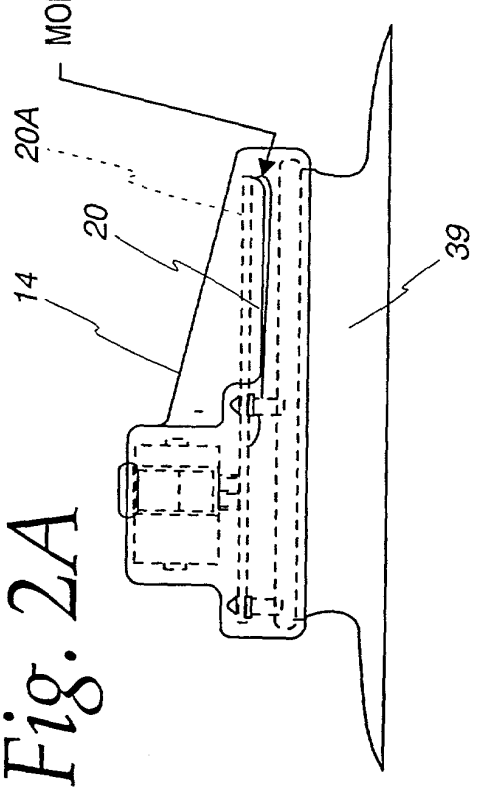



Fig. 2A

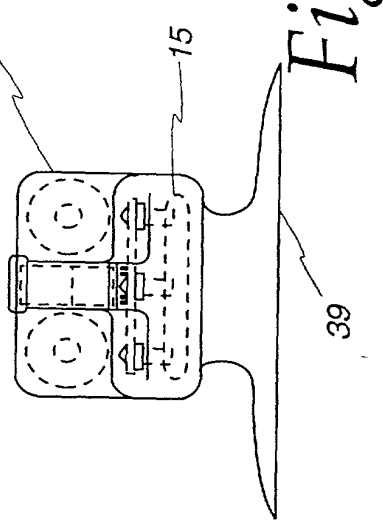



Fig. 2D

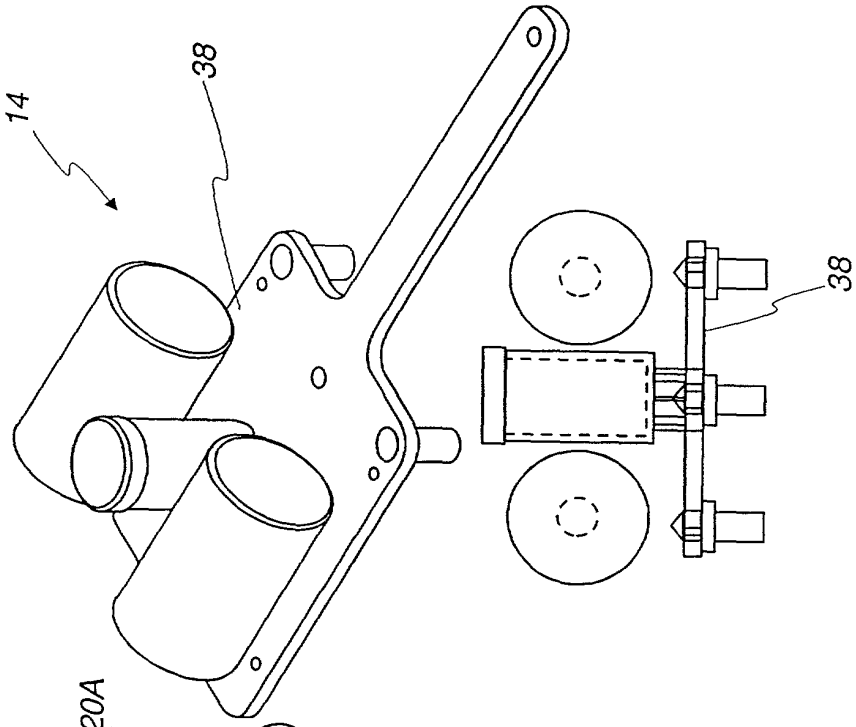



Fig. 3C




Fig. 3D

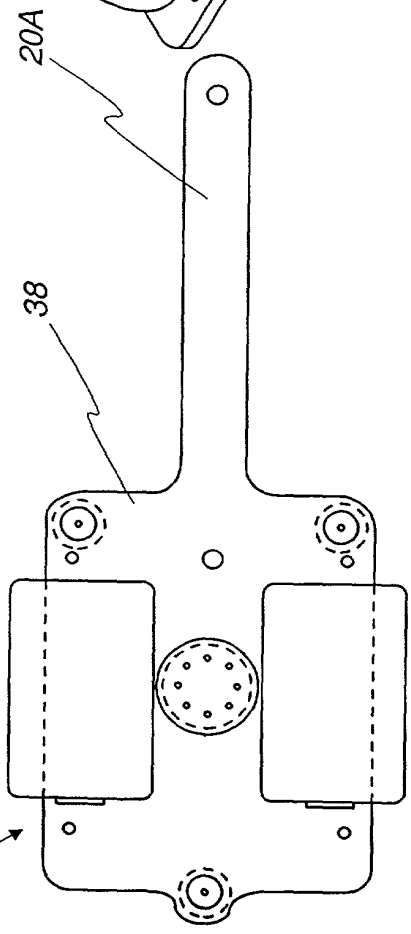



Fig. 3B

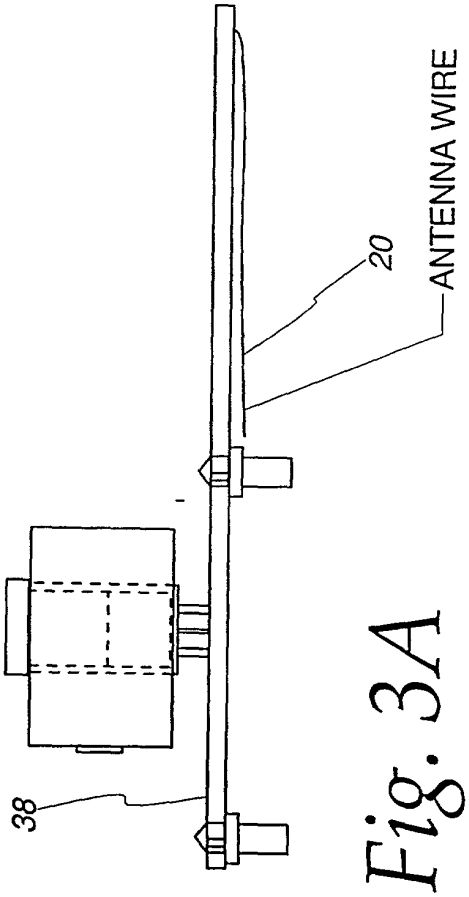


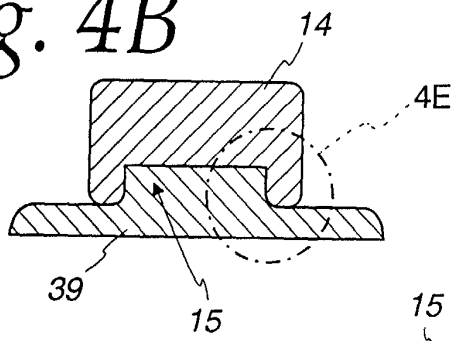

Fig. 3A

TD32/0 B209T660



In re Patent Application of Hardman et al.
CIP of 60/220,896, Filed: 7/26/00
Title: ELECTRONIC TIRE
MANAGEMENT SYSTEM
Mark V. Campagna, Esq
312-782-3939

Fig. 4B



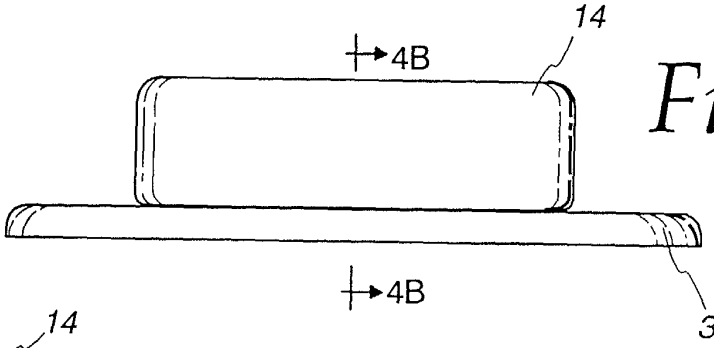




Fig. 4A

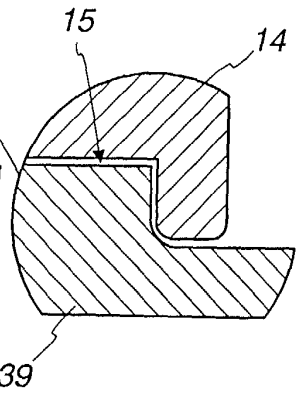



Fig. 4E

Fig. 4C

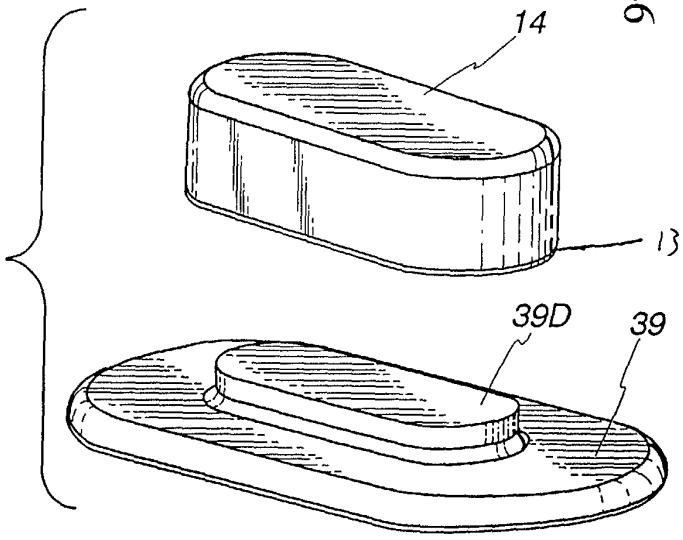
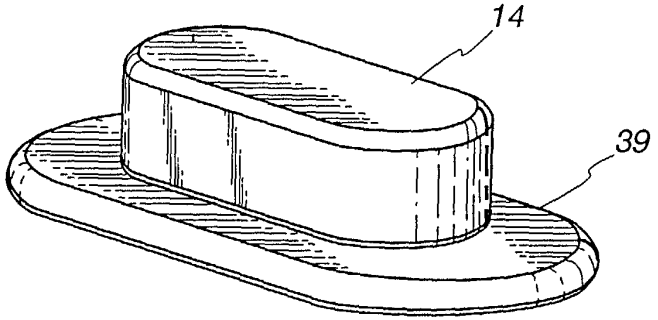



Fig. 4D



TD9220 B2097660



In re Patent Application of Hardman et al.
CIP of 60/220,896, Filed: 7/26/00
Title: ELECTRONIC TIRE MANAGEMENT SYSTEM
Mark V. Campagna, Esq
312-782-3939

Fig. 5B

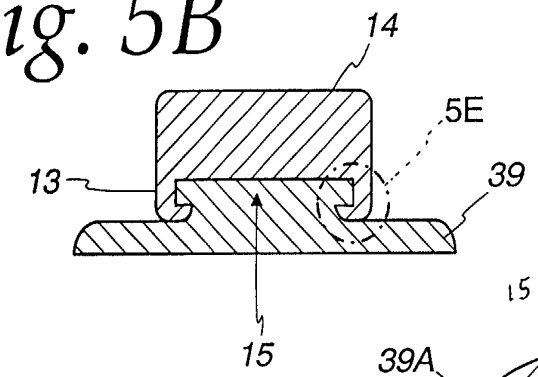



Fig. 5A

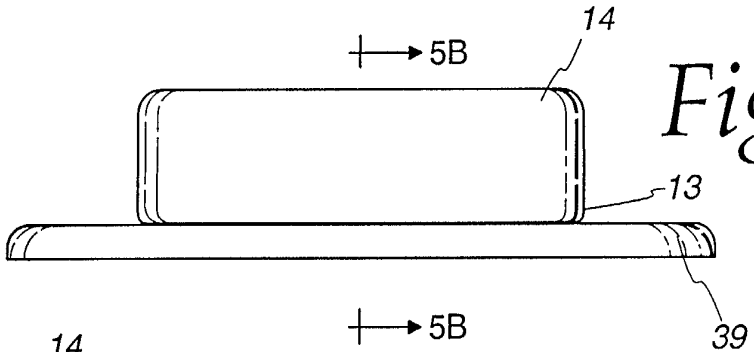



Fig. 5E

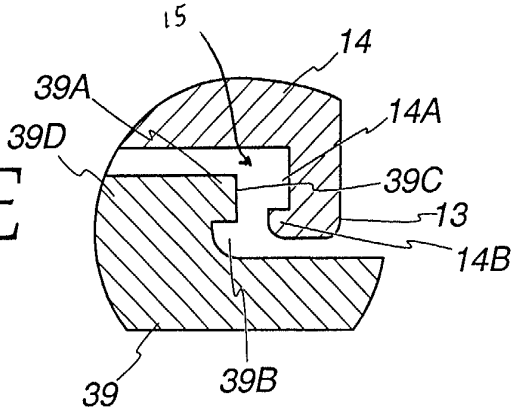



Fig. 5C

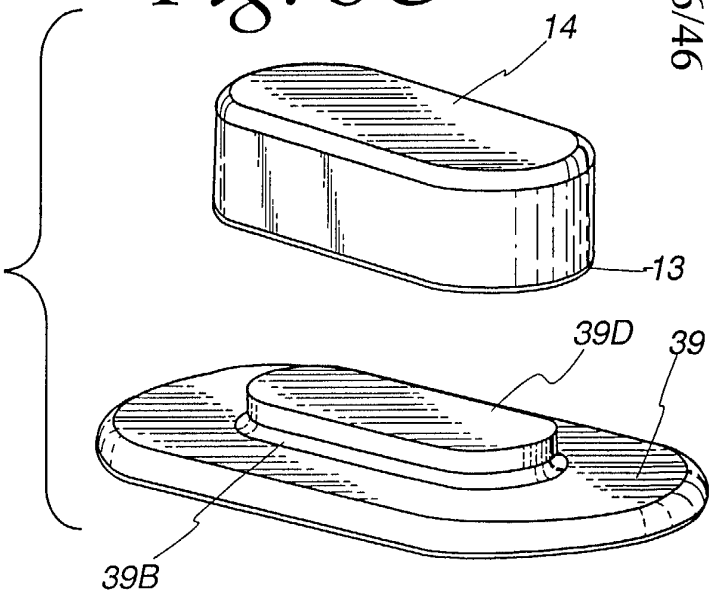



Fig. 5D

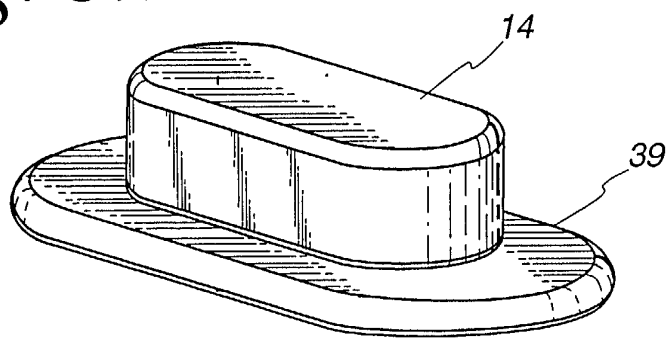


Fig. 6C

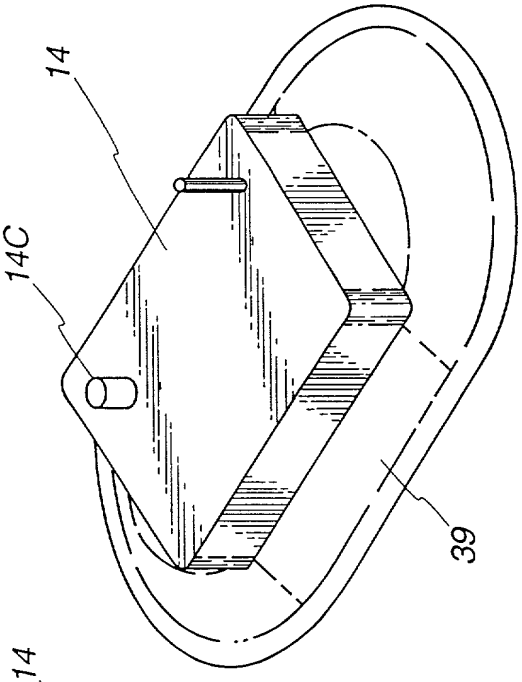



Fig. 6D

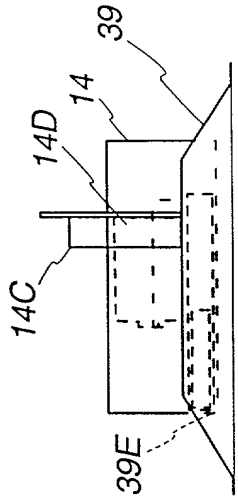



Fig. 6A

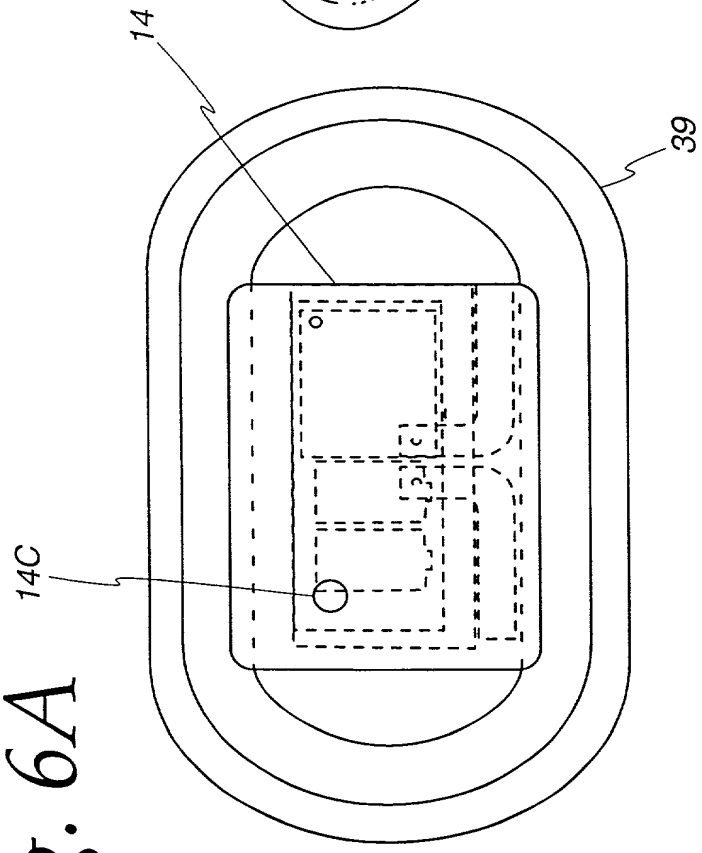



Fig. 6B

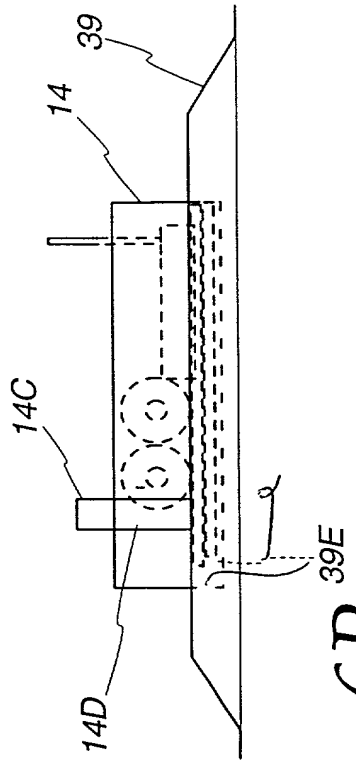
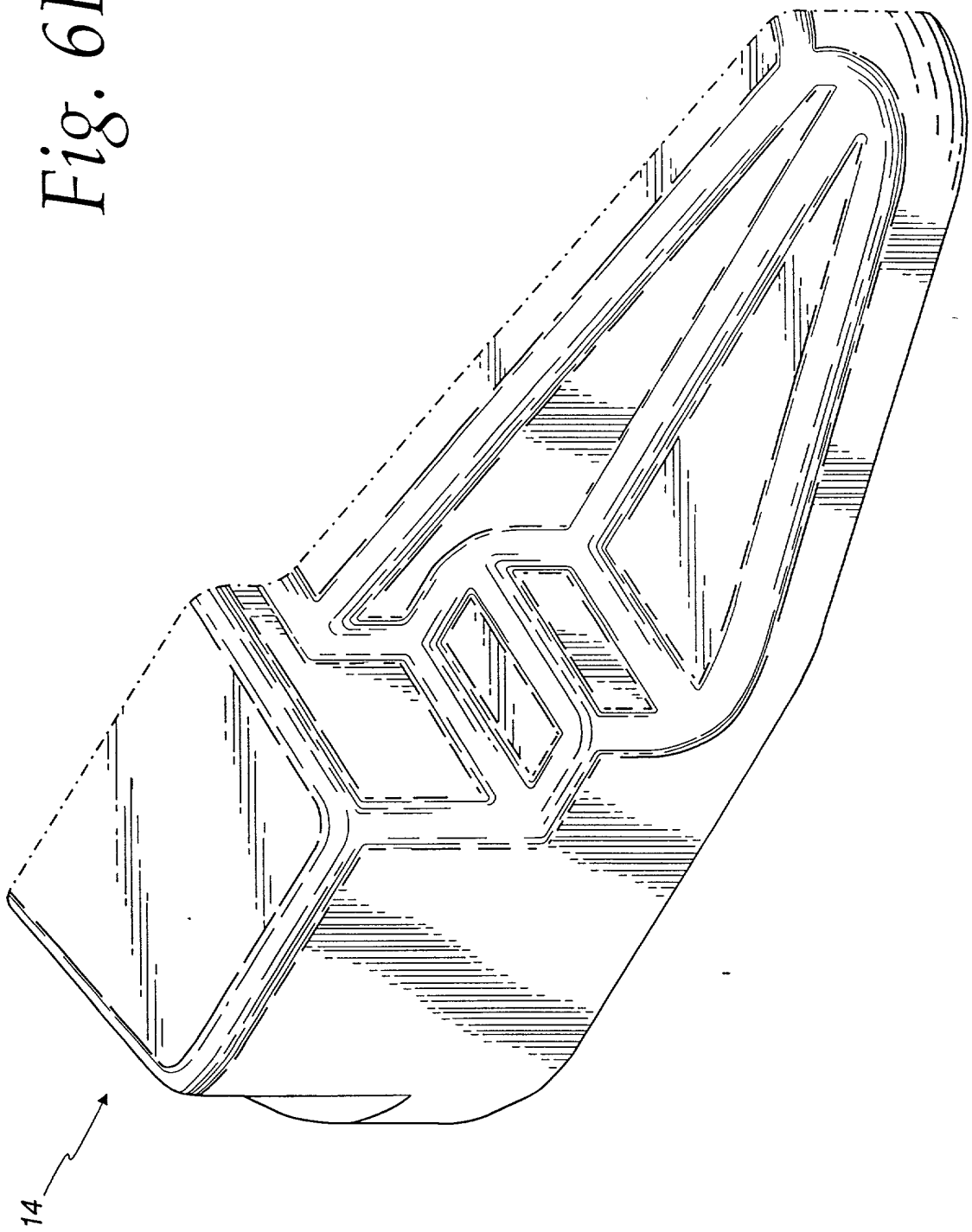


Fig. 6E



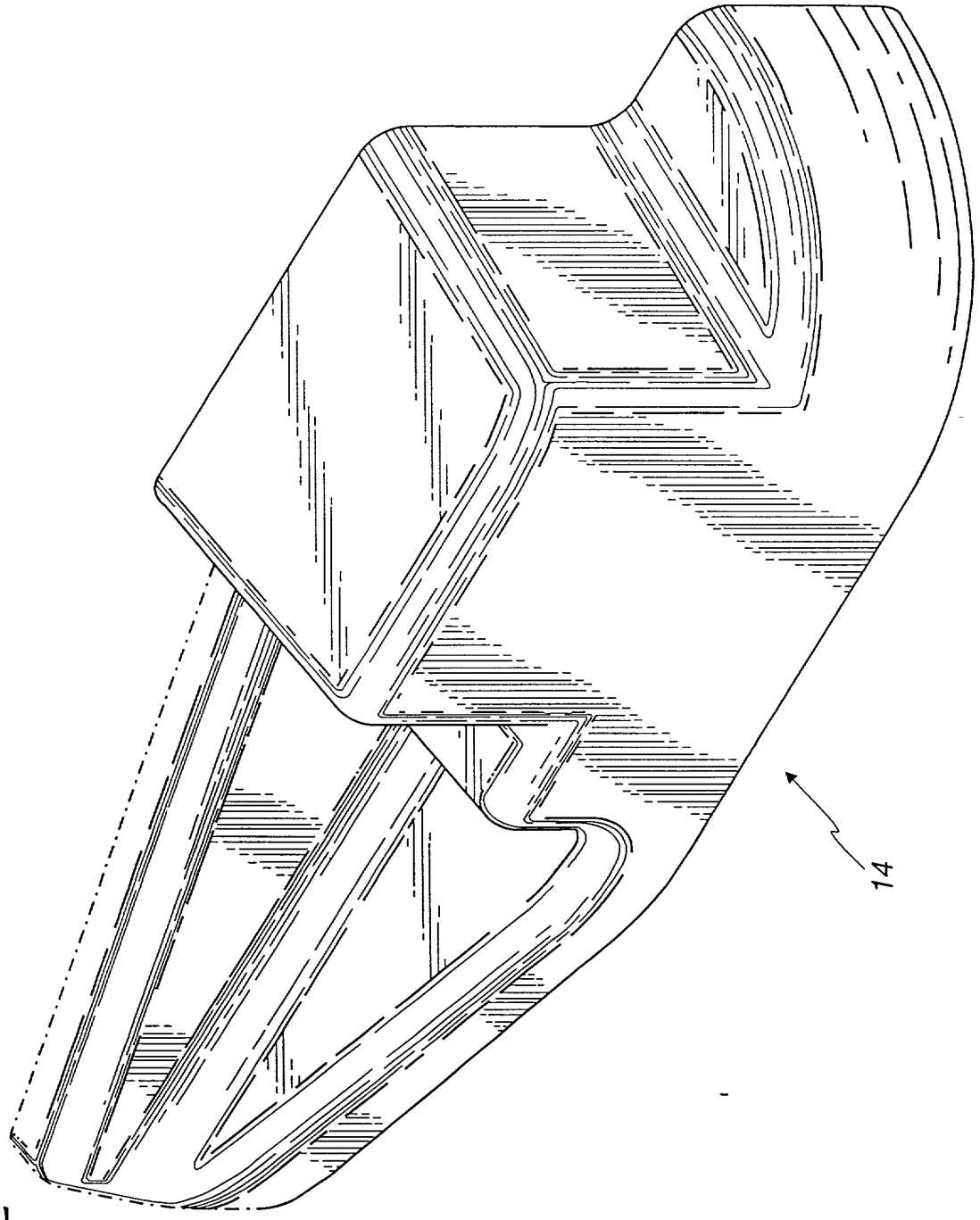



Fig. 6F

Fig. 7D

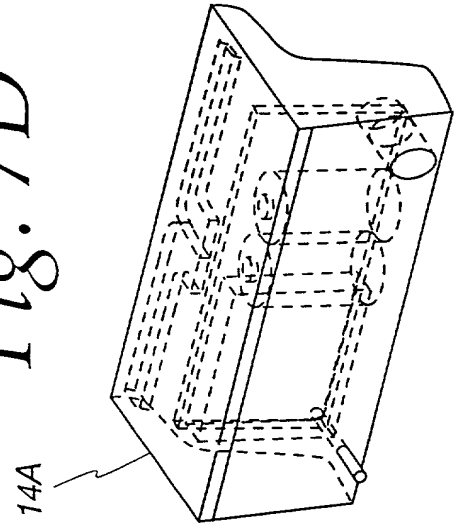



Fig. 7C

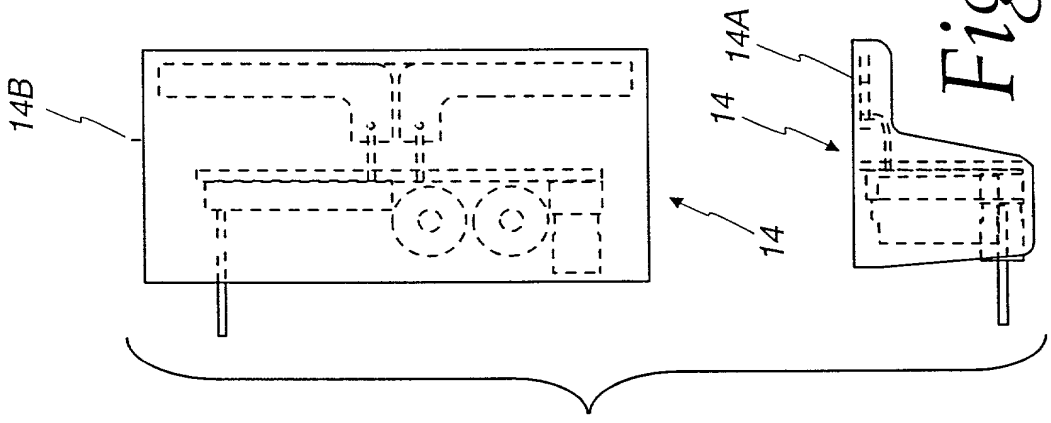



Fig. 7B

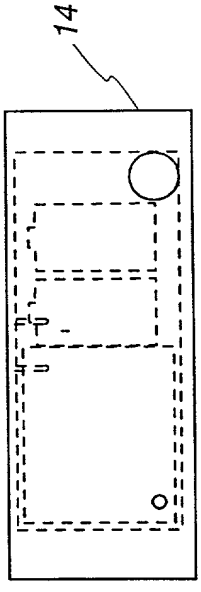
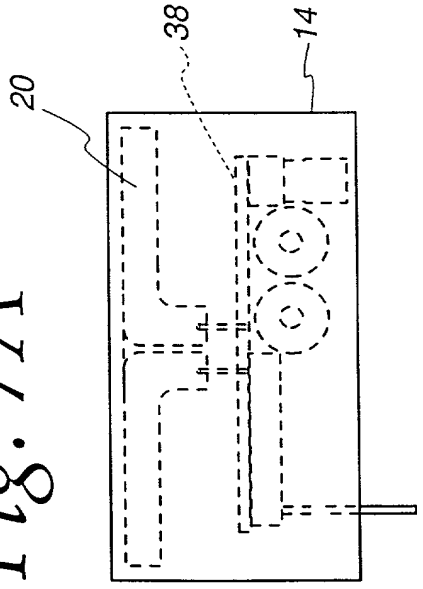



Fig. 7A



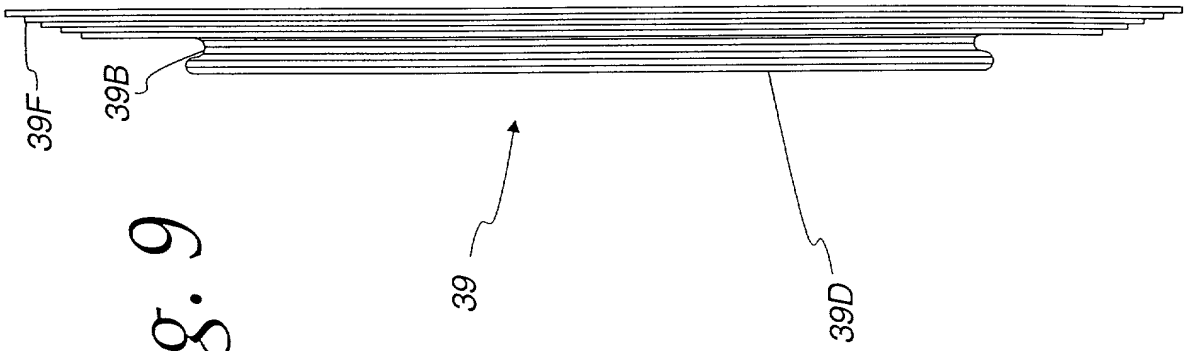



Fig. 9

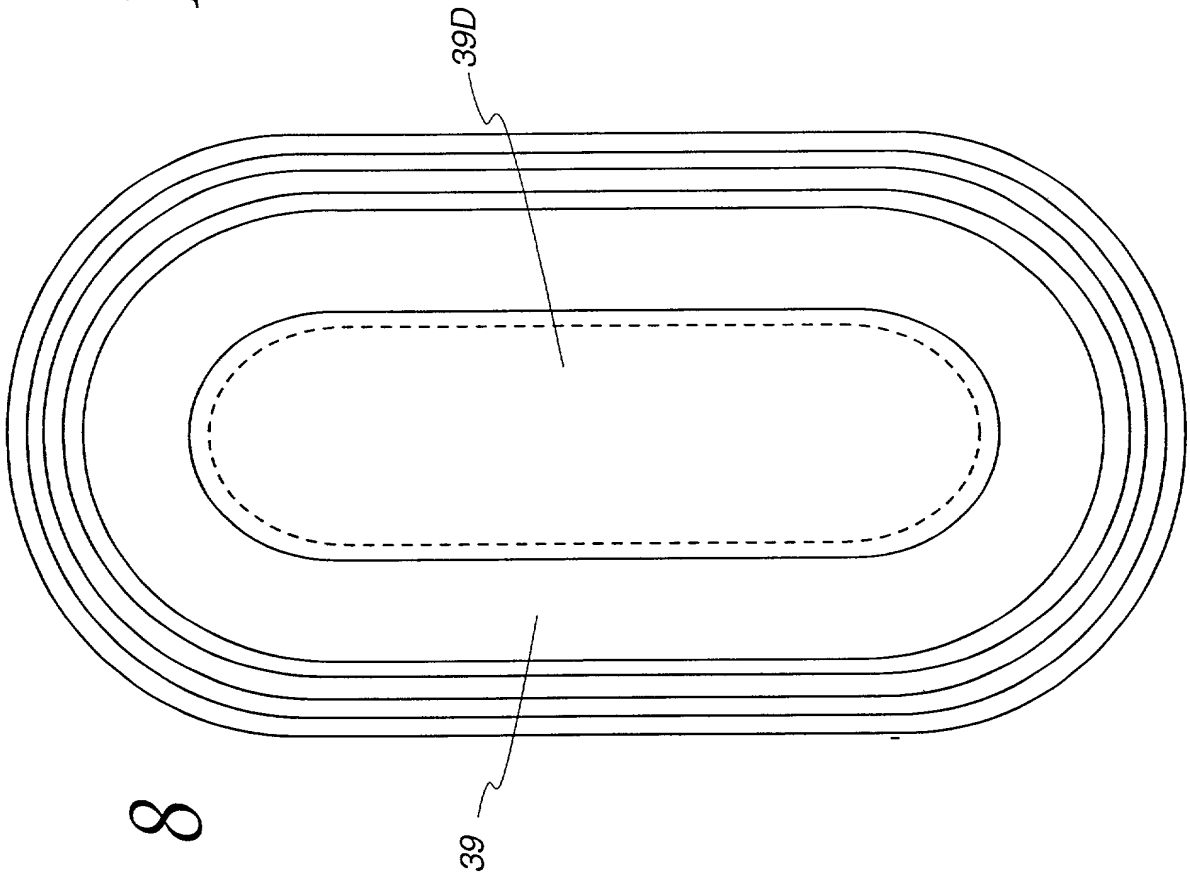



Fig. 8

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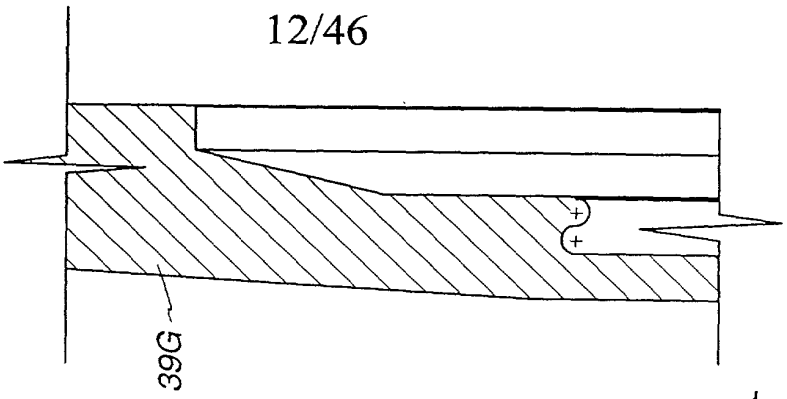



Fig. 10C

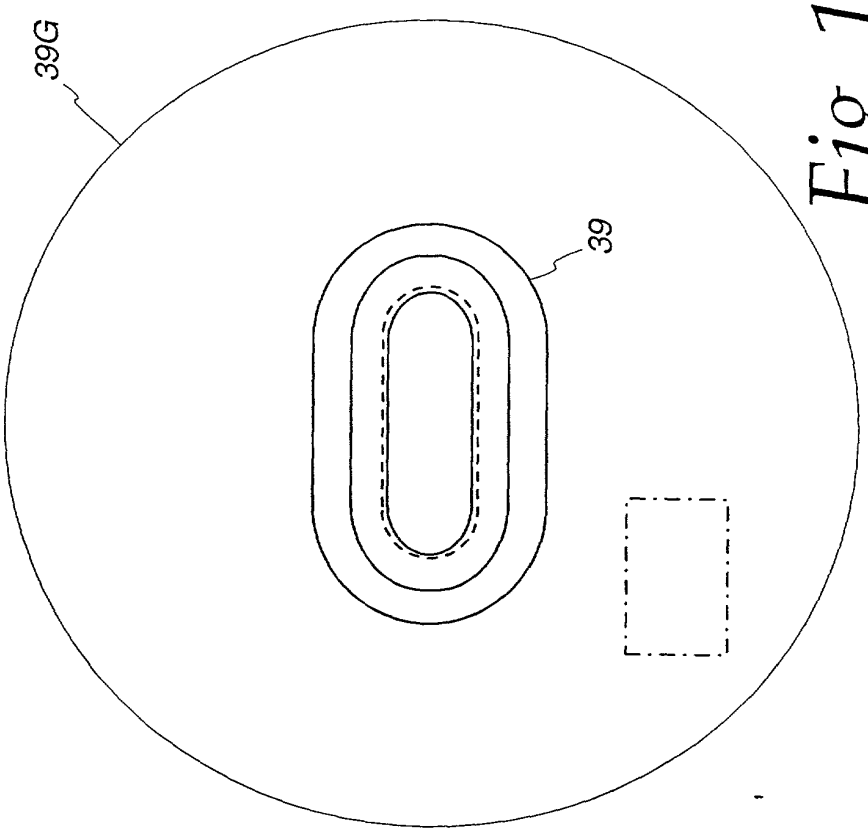



Fig. 10A

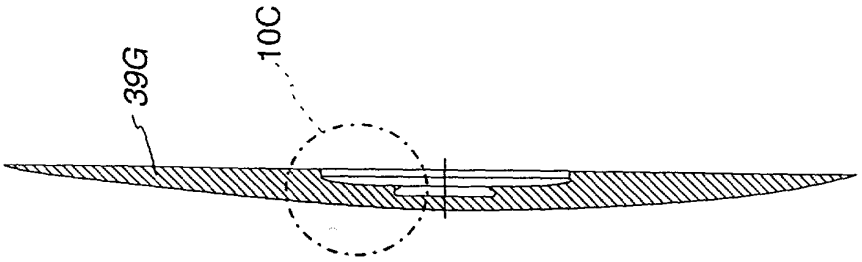



Fig. 10B

Fig. 11A

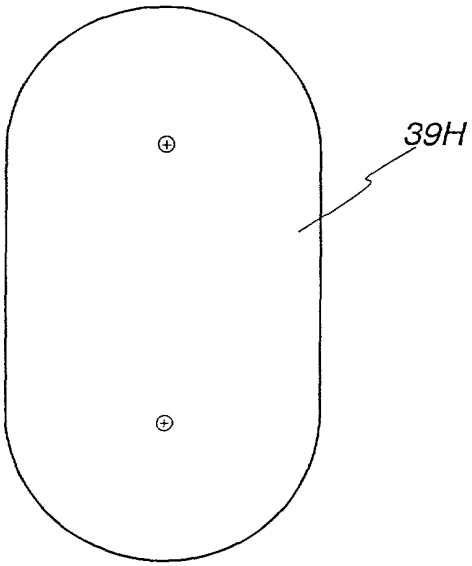
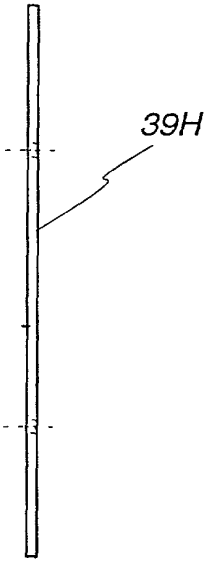
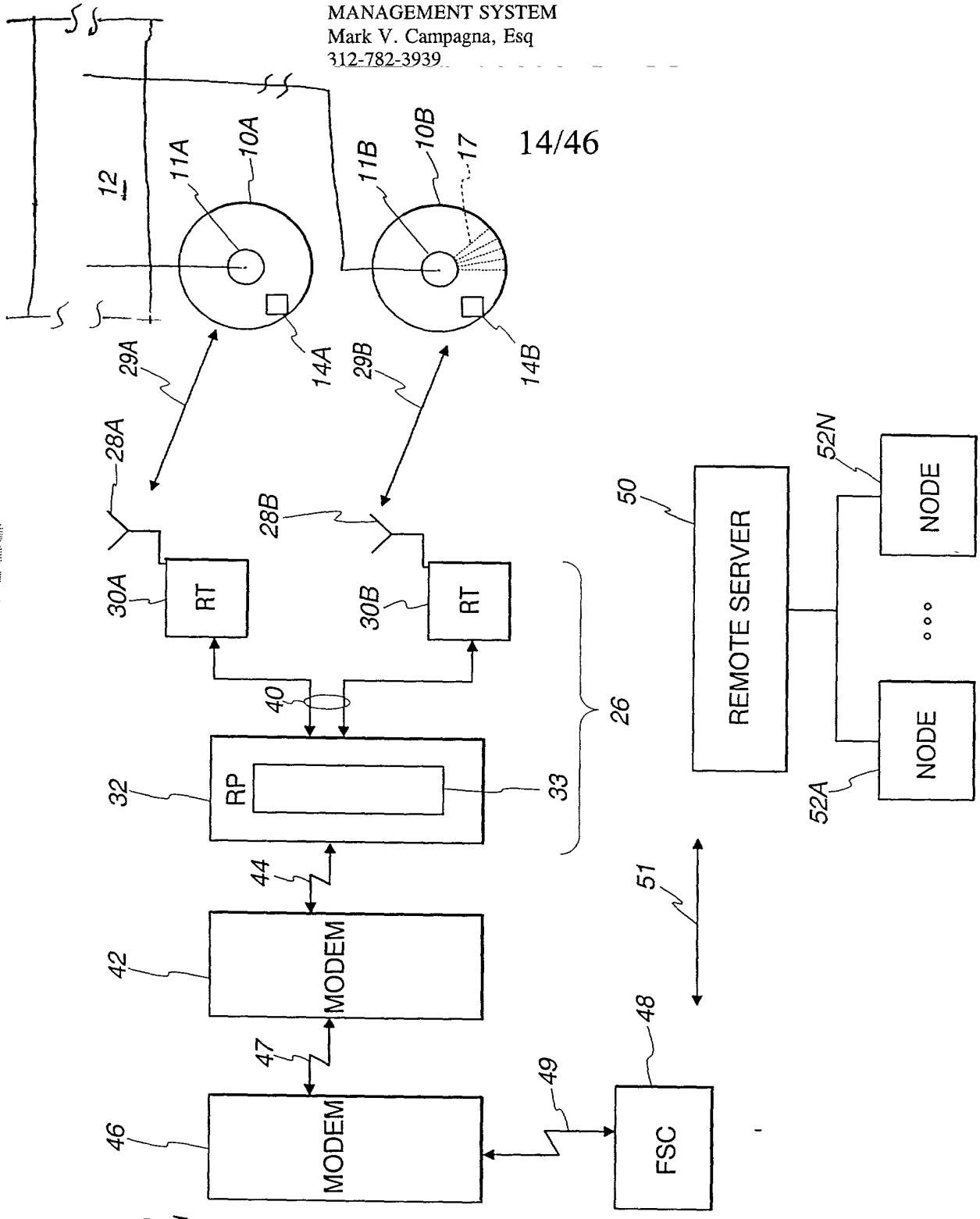



Fig. 11B

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RP
32
33
26
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MODEM
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MODEM
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49
FSC
48
51
50
REMOTE SERVER
52N
NODE
NODE
52A

Fig. 12

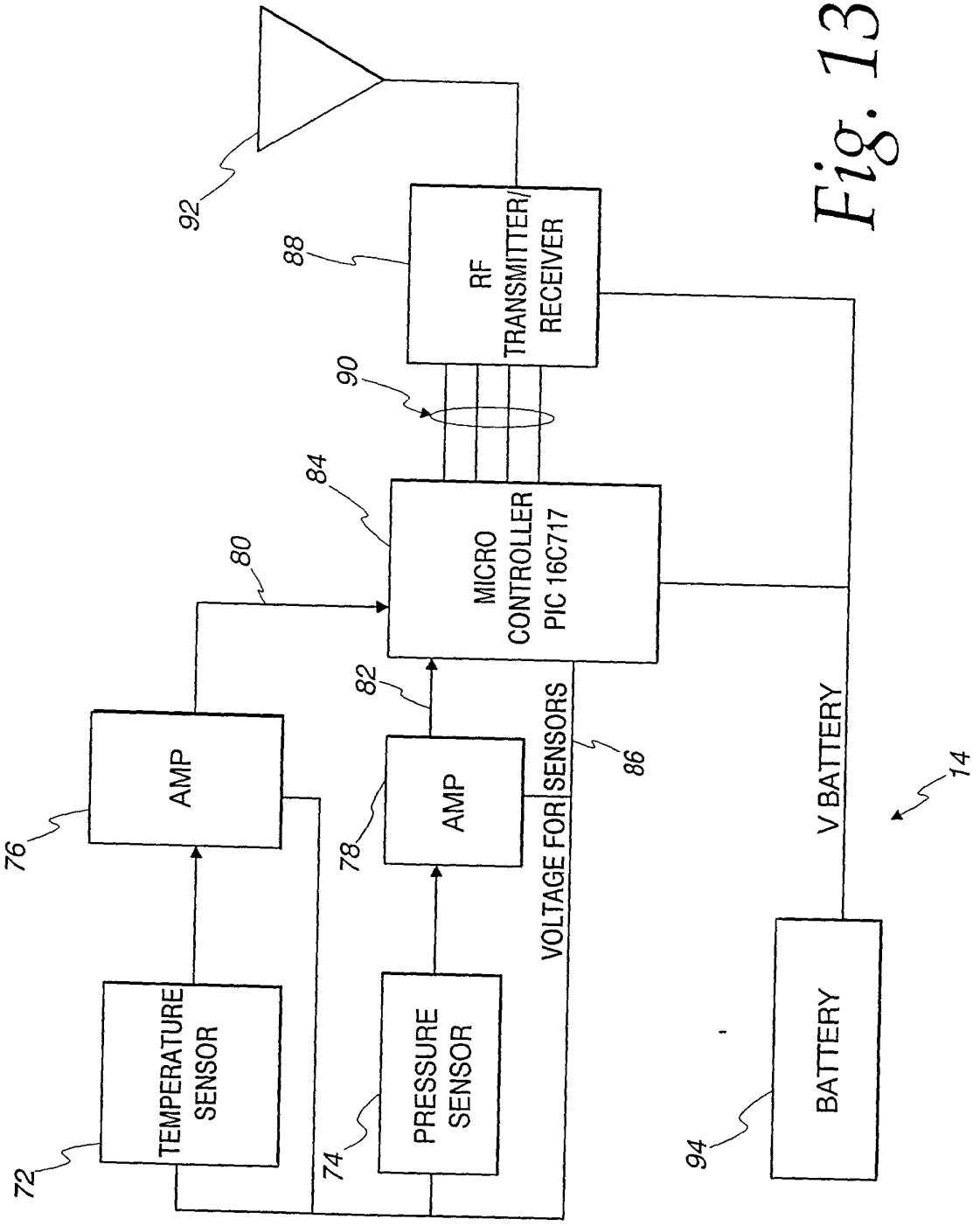
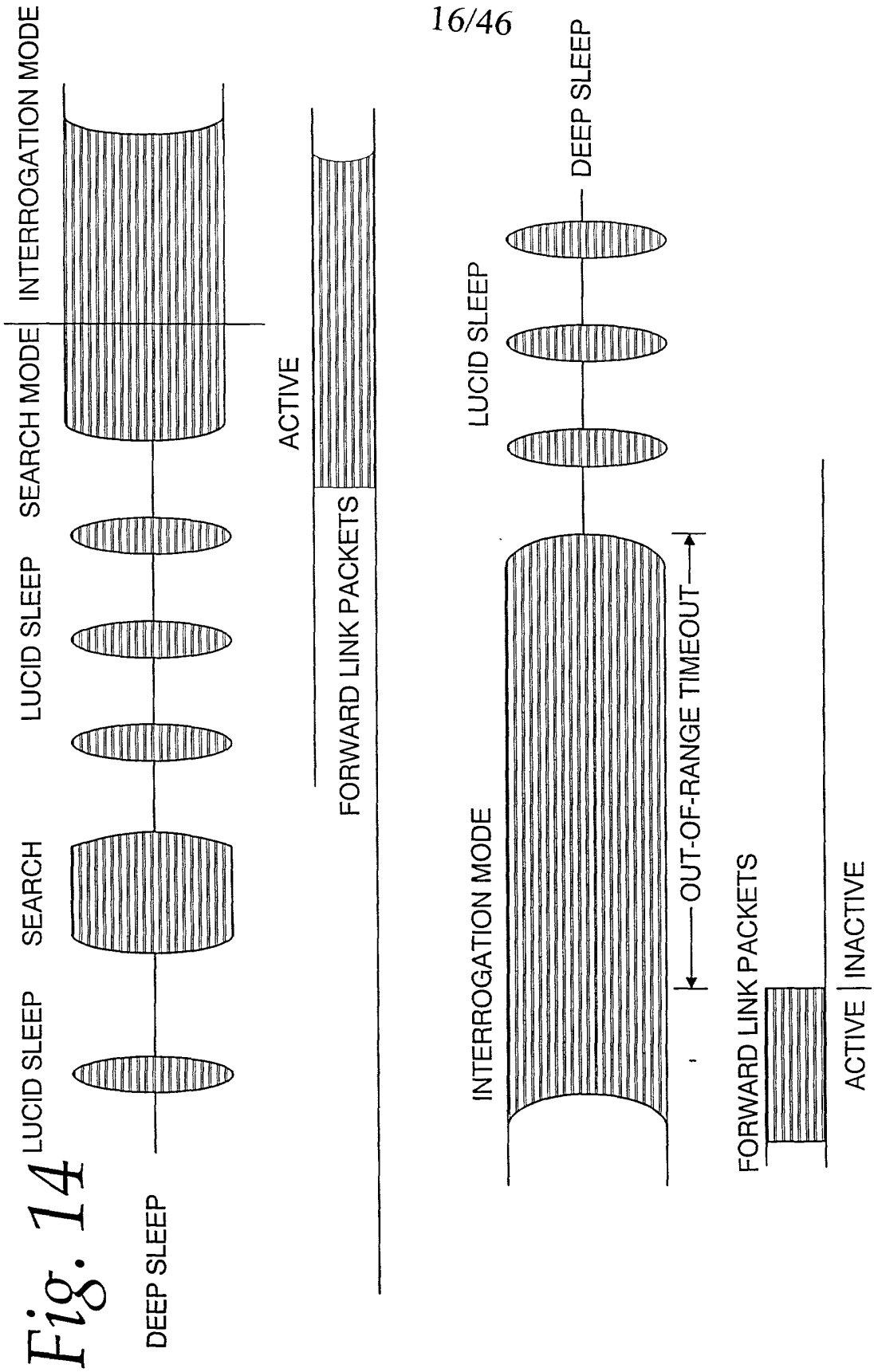

92
88
RF TRANSMITTER/ RECEIVER
90
84
MICRO CONTROLLER PIC 16C717
80
82
86
AMP
AMP
VOLTAGE FOR SENSORS
V BATTERY
14
76
78
TEMPERATURE SENSOR
PRESSURE SENSOR
72
74
BATTERY
94

Fig. 13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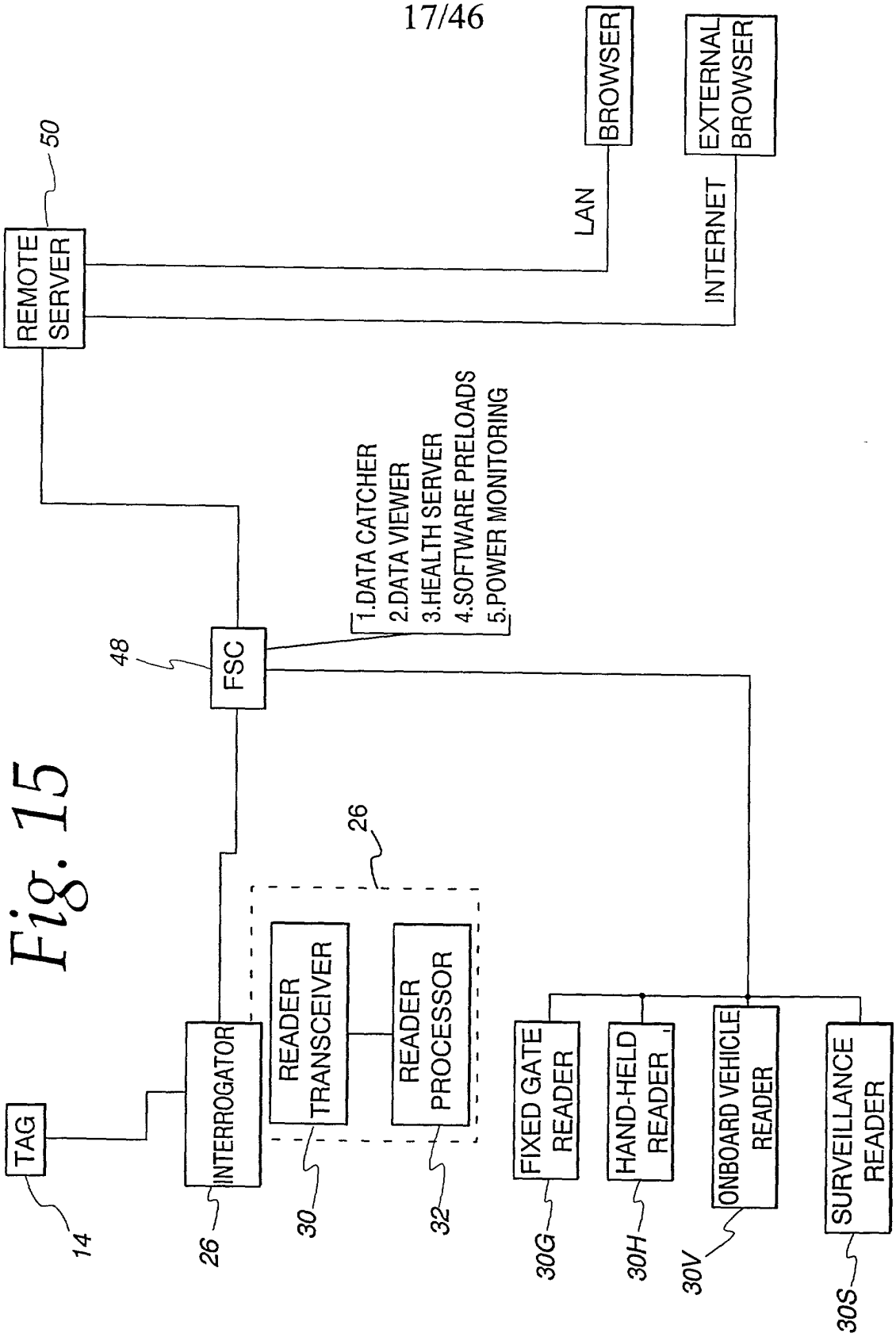
SEARCH MODE
LUCID SLEEP
SEARCH
LUCID SLEEP
DEEP SLEEP
ACTIVE
FORWARD LINK PACKETS
DEEP SLEEP
LUCID SLEEP
INTERROGATION MODE
OUT-OF-RANGE TIMEOUT
FORWARD LINK PACKETS
ACTIVE
INACTIVE

Fig. 14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LAN
EXTERNAL BROWSER
INTERNET
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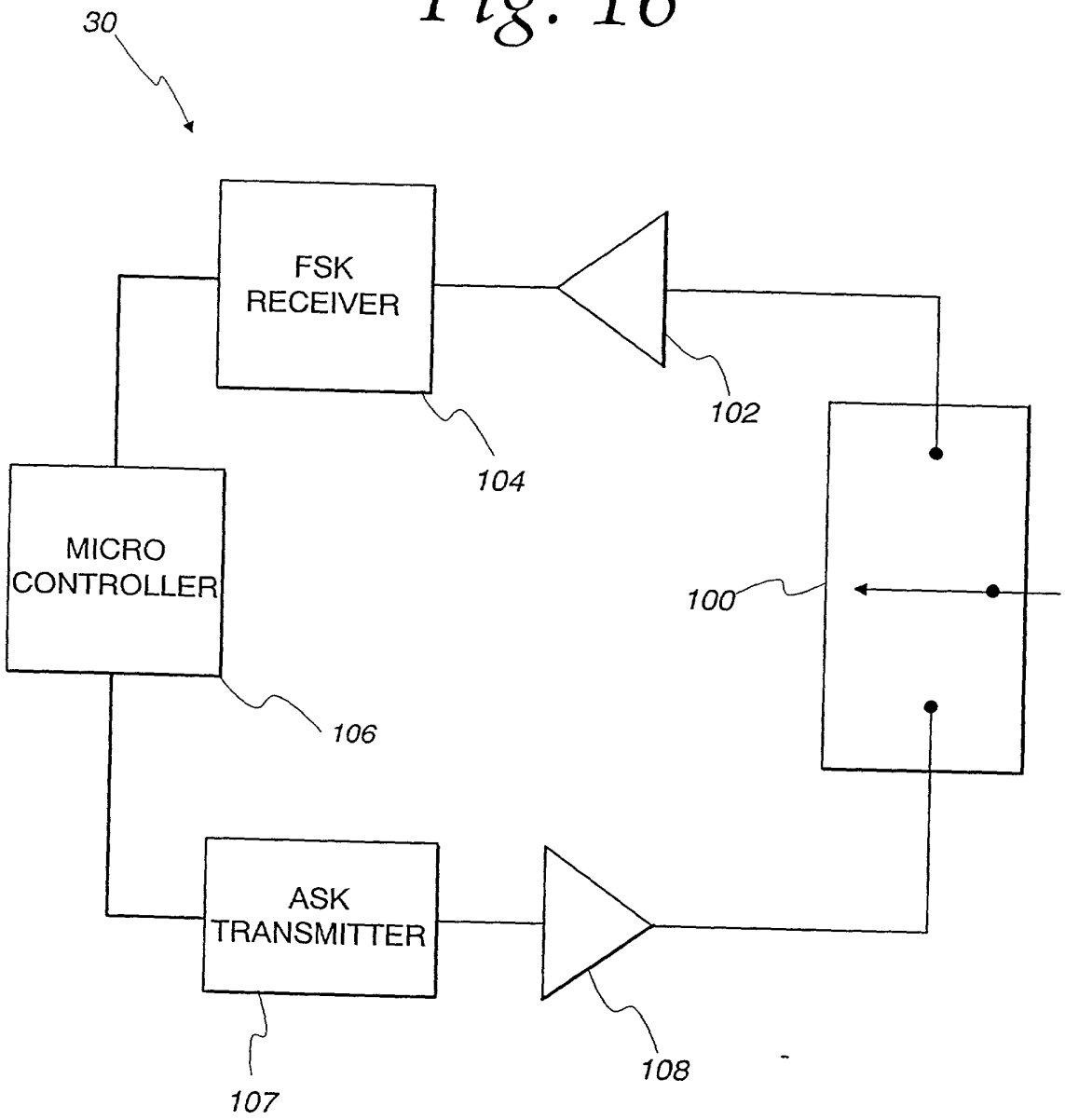
2.DATA VIEWER
3.HEALTH SERVER
4.SOFTWARE PRELOADS
5.POWER MONITORING
48
FSC
26
TAG
14
INTERROGATOR
26
READER TRANSCEIVER
30
READER PROCESSOR
32
FIXED GATE READER
30G
HAND-HELD READER
30H
ONBOARD VEHICLE READER
30V
SURVEILLANCE READER
30S

Fig. 15

*Fig. 16*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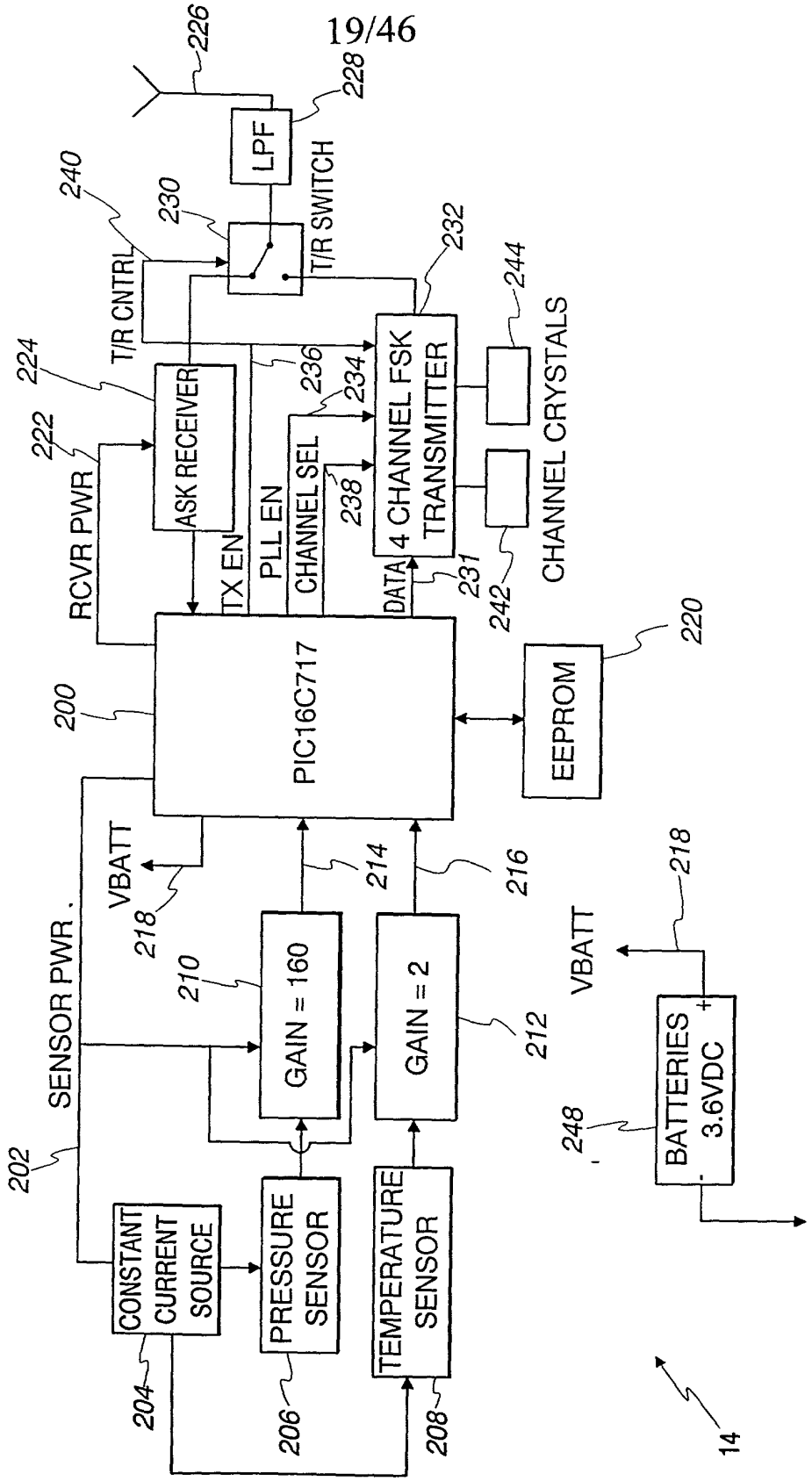
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LPF
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T/R SWITCH
T/R CNTRL
232
244
224
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CHANNEL CRYSTALS
222
ASK RECEIVER
RCVR PWR
TX EN
PLL EN
CHANNEL SEL
238
DATA
231
242
200
PIC16C717
EEPROM
220
VBATT
218
214
216
SENSOR PWR
210
GAIN = 160
GAIN = 2
212
VBATT
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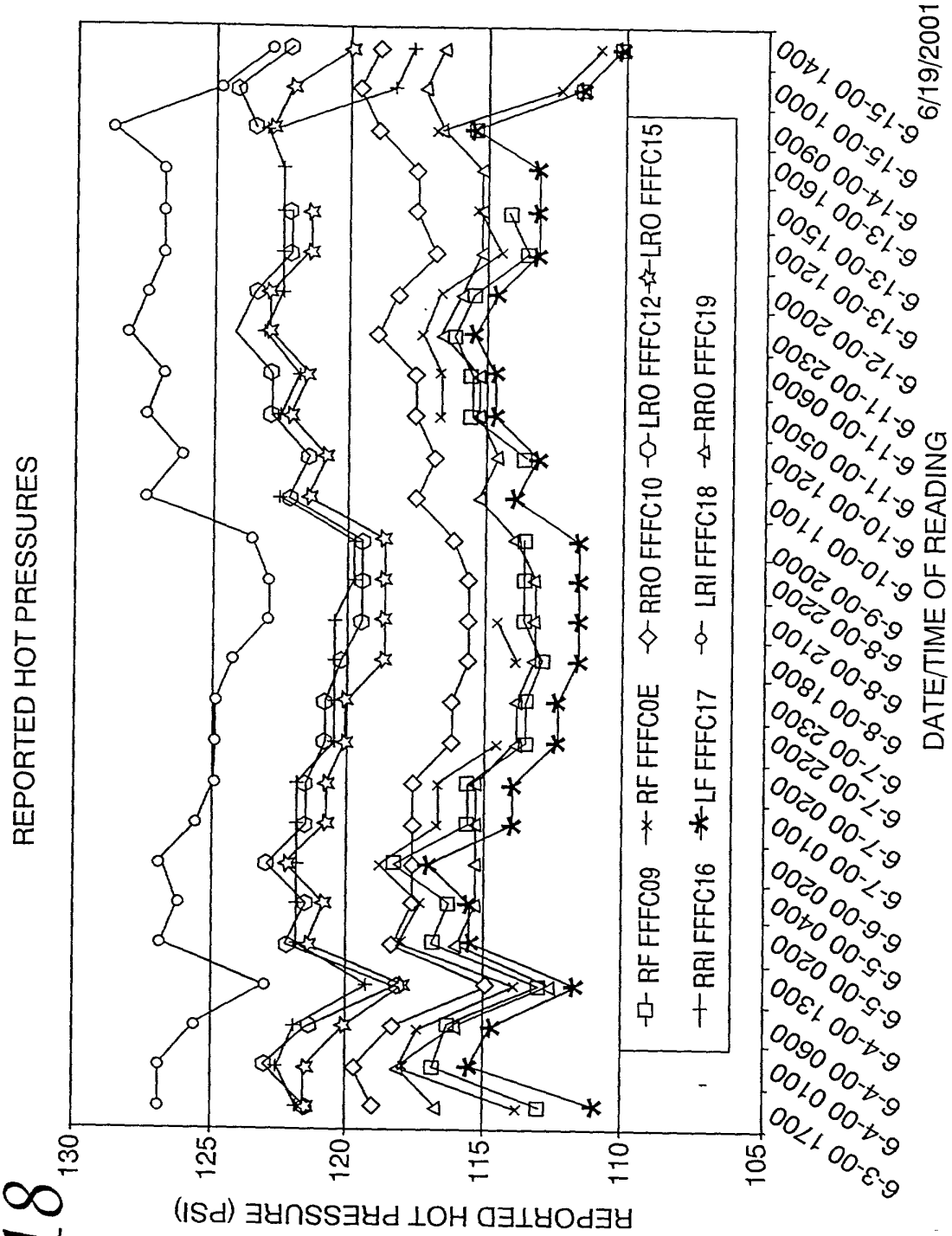
202
248
BATTERIES 3.6VDC
CONSTANT CURRENT SOURCE
PRESSURE SENSOR
TEMPERATURE SENSOR
204
206
208
14

Fig. 17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110
105
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RRO FFFC10
LRO FFFC12
LRO FFFC15
RRI FFFC16
LF FFFC17
LRI FFFC18
RRO FFFC19
6-3-00 1700
6-4-00 0100
6-4-00 0600
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6-5-00 0200
6-5-00 0400
6-6-00 0200
6-7-00 0100
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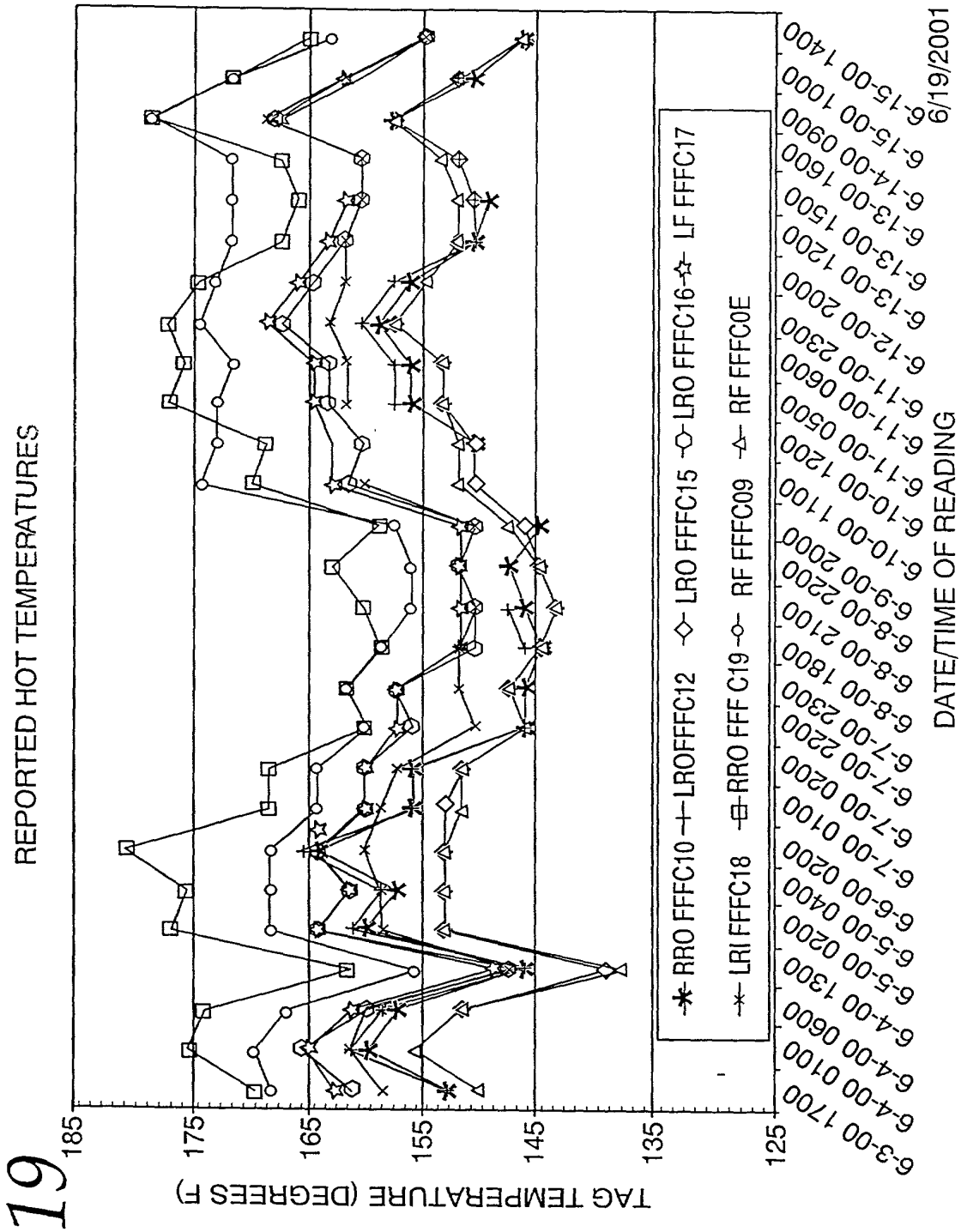
DATE/TIME OF READING

Fig. 18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LF FFFC17
LRI FFFC18
RRO FFF C19
RF FFFC09
RF FFFC0E
6-3-00 1700
6-4-00 0100
6-4-00 0600
6-4-00 1300
6-5-00 0200
6-5-00 0400
6-6-00 0200
6-7-00 0100
6-7-00 0200
6-7-00 2200
6-8-00 1800
6-8-00 2100
6-9-00 2200
6-10-00 1100
6-10-00 1200
6-11-00 0500
6-11-00 0600
6-12-00 2300
6-13-00 1200
6-13-00 1500
6-13-00 1600
6-14-00 0900
6-15-00 1000
6-15-00 1400
6/19/2001
DATE/TIME OF READING

Fig. 19

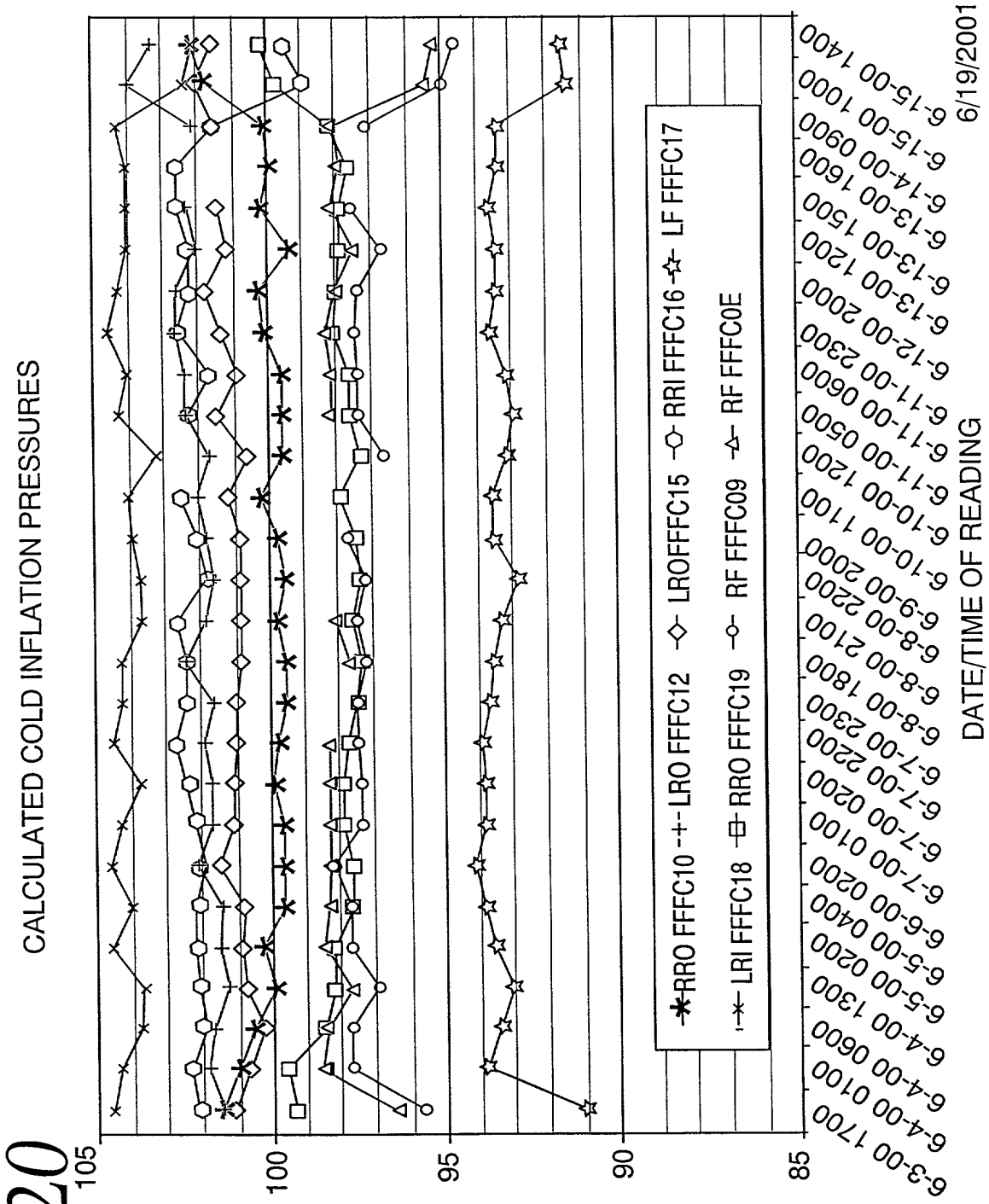

CALCULATED COLD INFLATION PRESSURES
CALCULATED COLD (70F) INFL. PRESSURE (PSI)
105
100
95
90
85
RRO FFFC10
LRO FFFC12
LROFFFC15
RRI FFFC16
LF FFFC17
LRI FFFC18
RRO FFFC19
RF FFFC09
RF FFFC0E
6-3-00 1700
6-4-00 0100
6-4-00 0600
6-4-00 1300
6-5-00 0200
6-5-00 0400
6-6-00 0200
6-7-00 0100
6-7-00 0200
6-7-00 2200
6-7-00 2300
6-8-00 1800
6-8-00 2100
6-9-00 2200
6-10-00 2000
6-10-00 1100
6-11-00 1200
6-11-00 0500
6-11-00 0600
6-11-00 2300
6-12-00 2000
6-13-00 1200
6-13-00 1500
6-13-00 1600
6-14-00 0900
6-15-00 1000
6-15-00 1400
6/19/2001
DATE/TIME OF READING

Fig. 20

Fig. 21

TAG LOGIC FOR
SAR COMMAND PROCESS

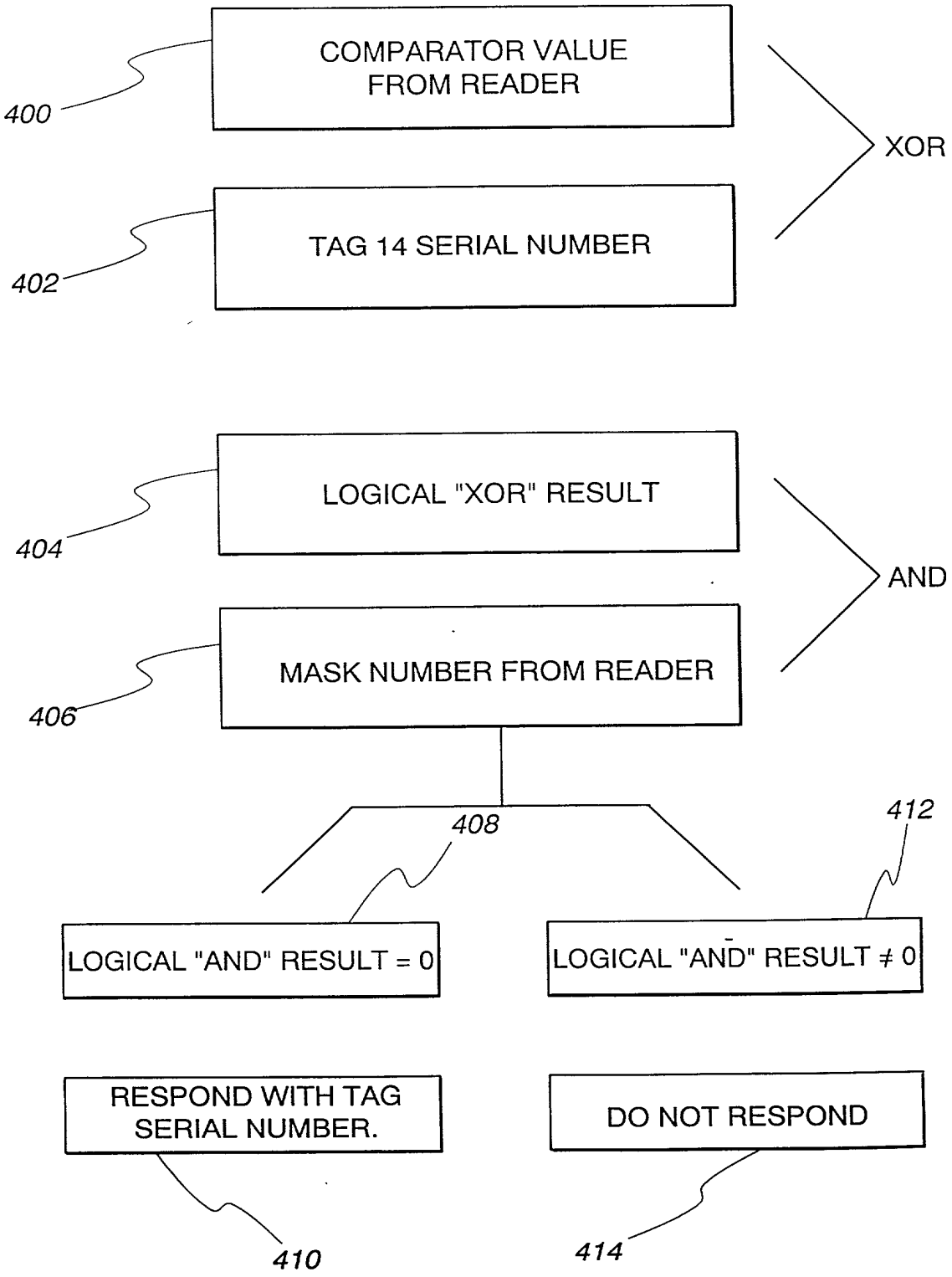


Fig. 22

READER LOGIC FOR
SAR TAG ACQUISITION

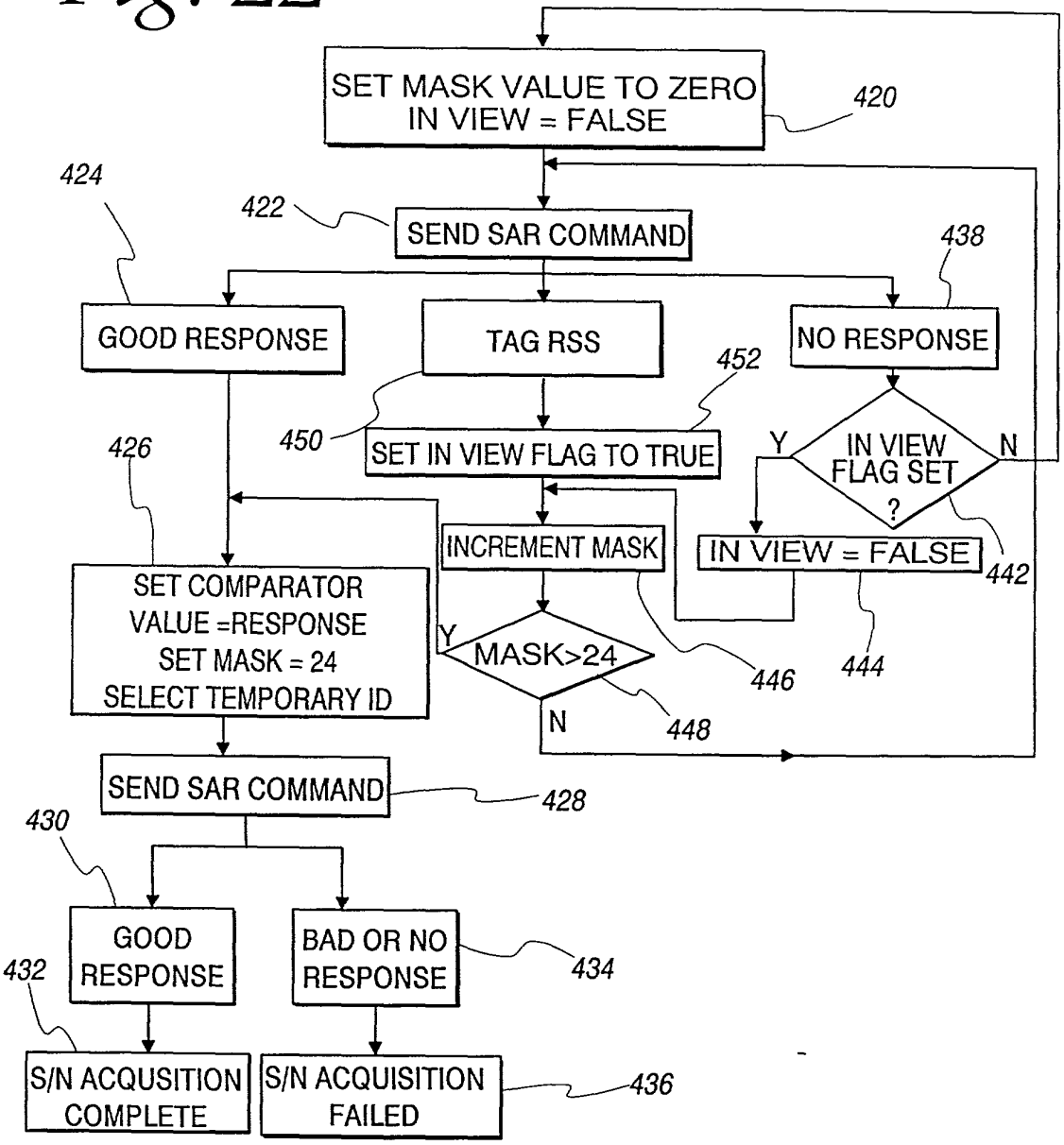


Fig. 23

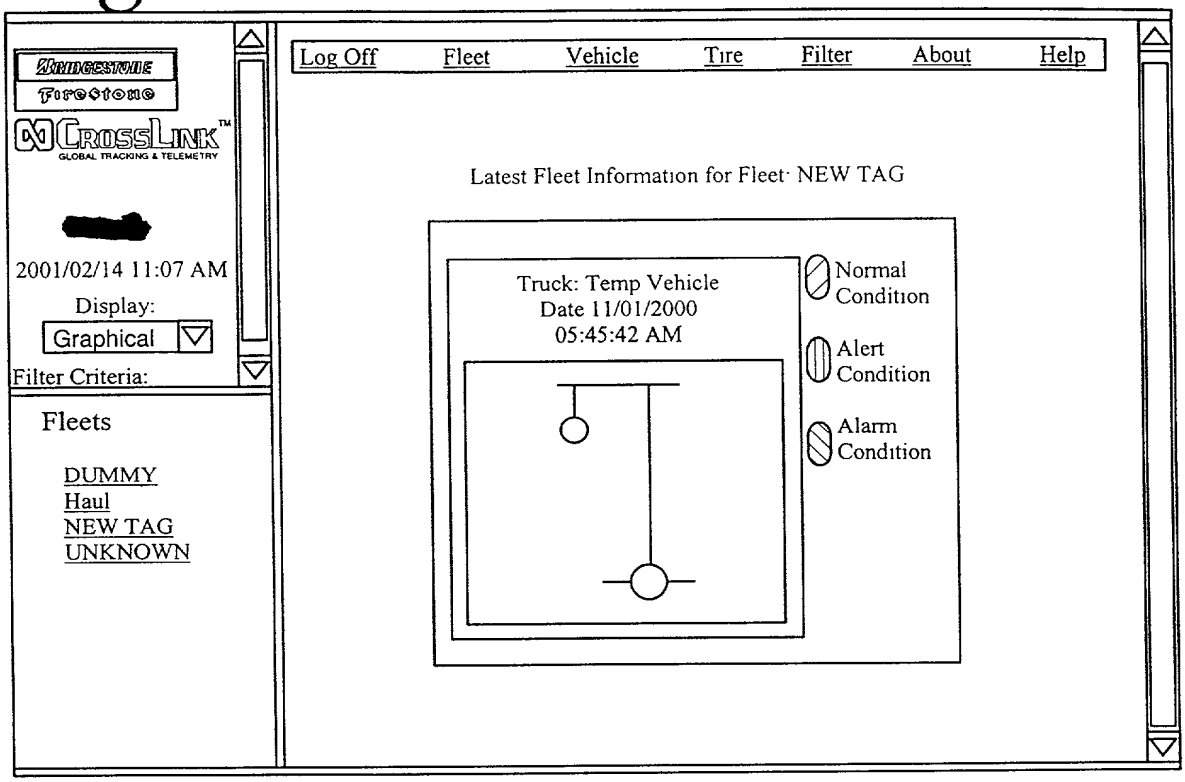
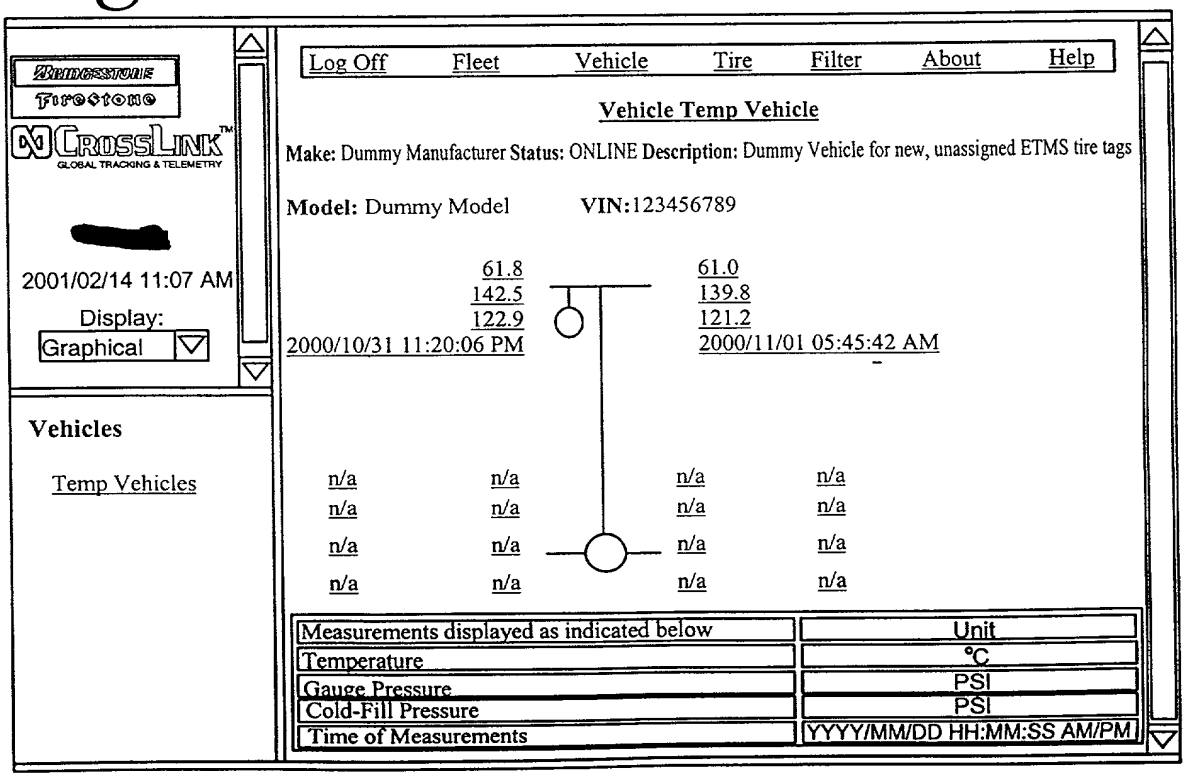
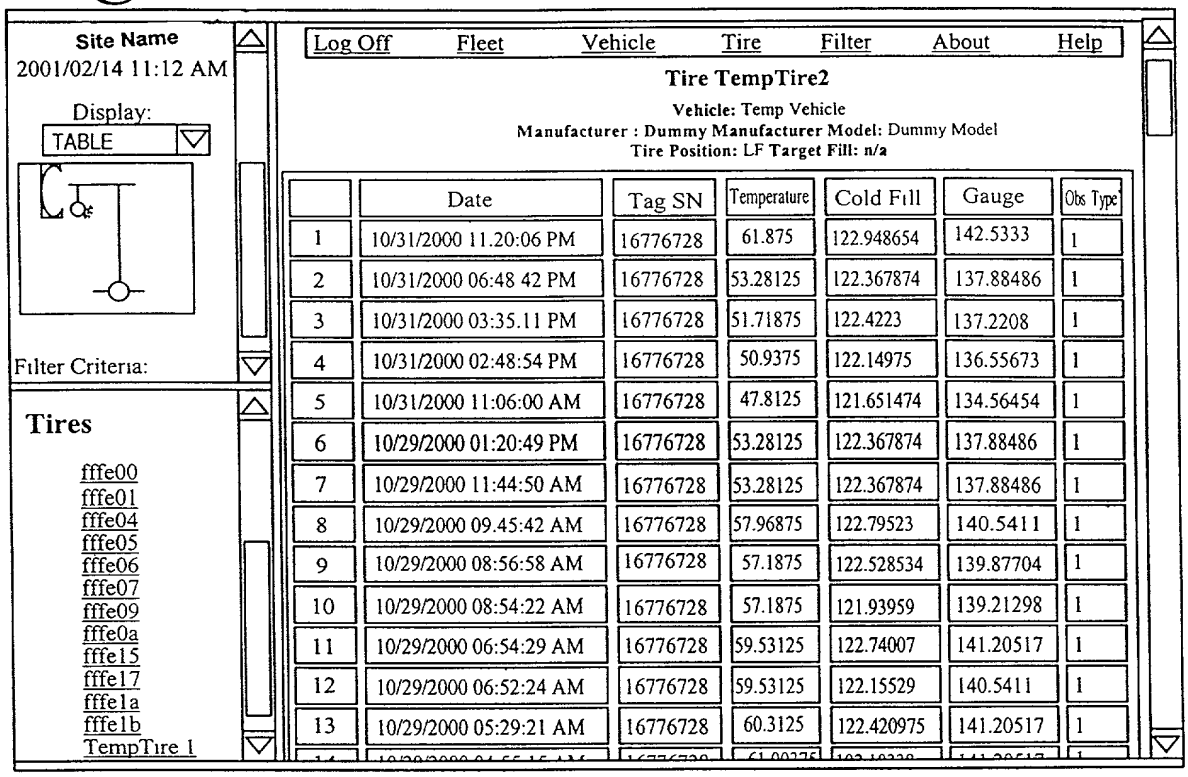

Log Off
Fleet
Vehicle
Tire
Filter
About
Help
Latest Fleet Information for Fleet: NEW TAG
Truck: Temp Vehicle
Date 11/01/2000
05:45:42 AM
Normal Condition
Alert Condition
Alarm Condition
2001/02/14 11:07 AM
Display:
Graphical
Filter Criteria:
Fleets
DUMMY
Haul
NEW TAG
UNKNOWN

Fig. 24


Log Off
Fleet
Vehicle
Tire
Filter
About
Help
Vehicle Temp Vehicle
Make: Dummy Manufacturer Status: ONLINE Description: Dummy Vehicle for new, unassigned ETMS tire tags
Model: Dummy Model
VIN:123456789
61.8
142.5
122.9
2000/10/31 11:20:06 PM
61.0
139.8
121.2
2000/11/01 05:45:42 AM
n/a
Measurements displayed as indicated below
Unit
Temperature
°C
Gauge Pressure
PSI
Cold-Fill Pressure
PSI
Time of Measurements
YYYY/MM/DD HH:MM:SS AM/PM
2001/02/14 11:07 AM
Display:
Graphical
Vehicles
Temp Vehicles

# Fig. 25






| | Date | Tag SN | Temperature | Cold Fill | Gauge | Obs Type |
|---|---|---|---|---|---|---|
| 1 | 10/31/2000 11.20:06 PM | 16776728 | 61.875 | 122.948654 | 142.5333 | 1 |
| 2 | 10/31/2000 06:48 42 PM | 16776728 | 53.28125 | 122.367874 | 137.88486 | 1 |
| 3 | 10/31/2000 03:35.11 PM | 16776728 | 51.71875 | 122.4223 | 137.2208 | 1 |
| 4 | 10/31/2000 02:48:54 PM | 16776728 | 50.9375 | 122.14975 | 136.55673 | 1 |
| 5 | 10/31/2000 11:06:00 AM | 16776728 | 47.8125 | 121.651474 | 134.56454 | 1 |
| 6 | 10/29/2000 01:20:49 PM | 16776728 | 53.28125 | 122.367874 | 137.88486 | 1 |
| 7 | 10/29/2000 11:44:50 AM | 16776728 | 53.28125 | 122.367874 | 137.88486 | 1 |
| 8 | 10/29/2000 09.45:42 AM | 16776728 | 57.96875 | 122.79523 | 140.5411 | 1 |
| 9 | 10/29/2000 08:56:58 AM | 16776728 | 57.1875 | 122.528534 | 139.87704 | 1 |
| 10 | 10/29/2000 08:54:22 AM | 16776728 | 57.1875 | 121.93959 | 139.21298 | 1 |
| 11 | 10/29/2000 06:54:29 AM | 16776728 | 59.53125 | 122.74007 | 141.20517 | 1 |
| 12 | 10/29/2000 06:52:24 AM | 16776728 | 59.53125 | 122.15529 | 140.5411 | 1 |
| 13 | 10/29/2000 05:29:21 AM | 16776728 | 60.3125 | 122.420975 | 141.20517 | 1 |

# Fig. 26

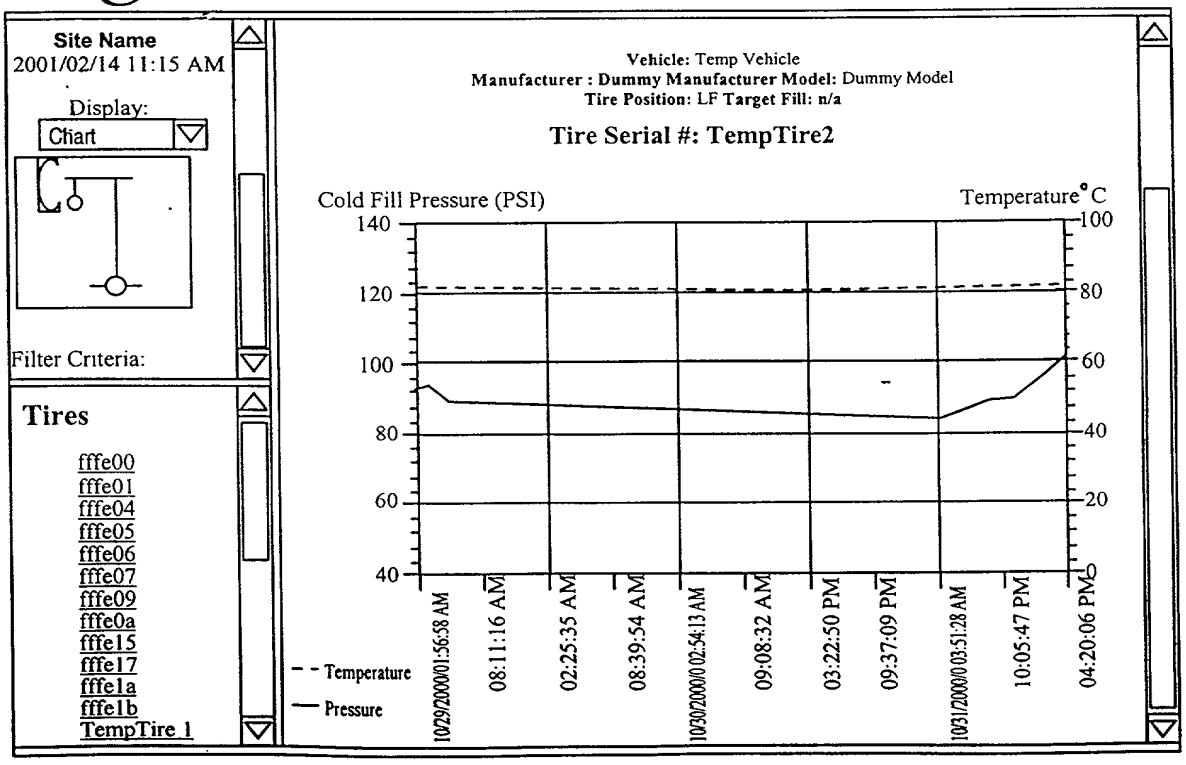


Fig. 27

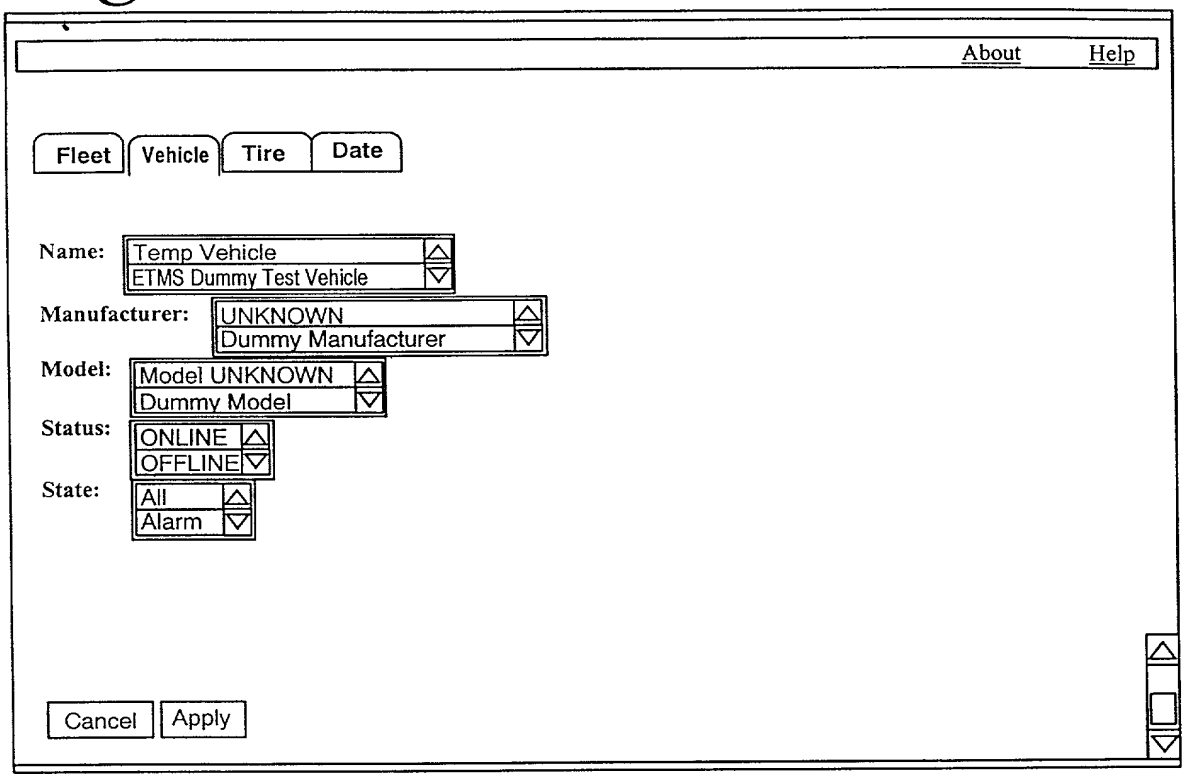
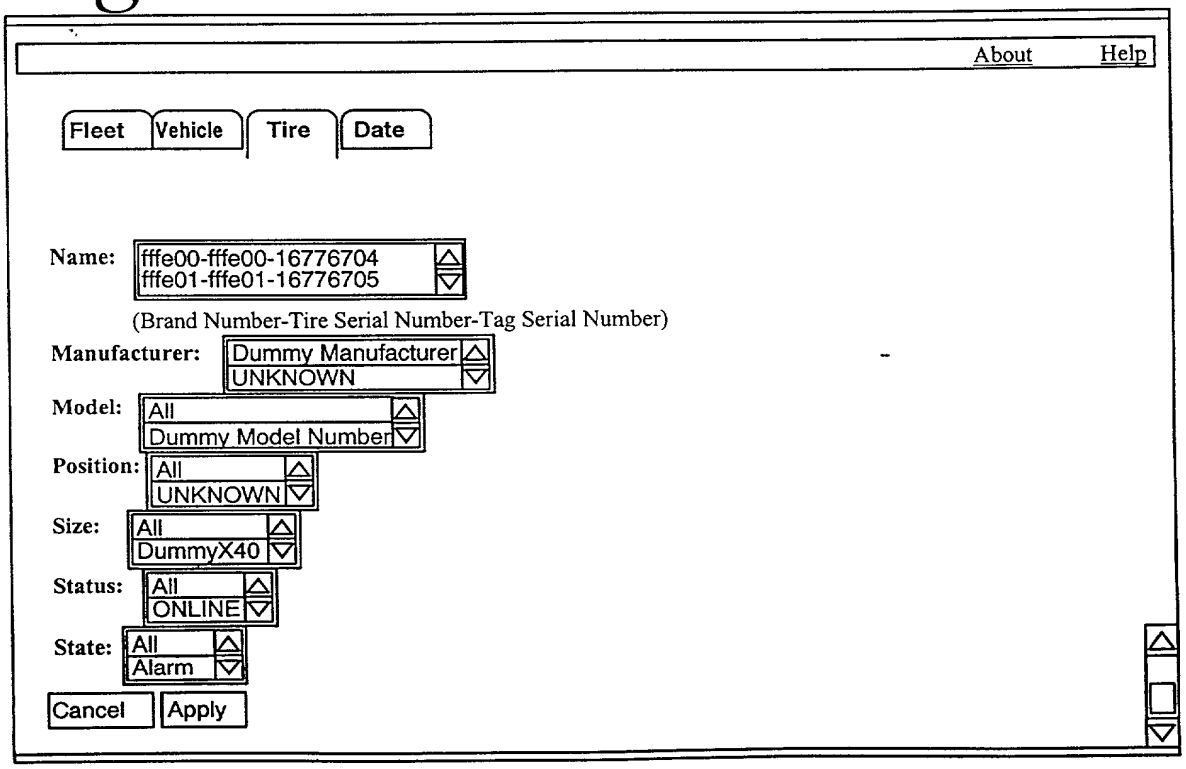
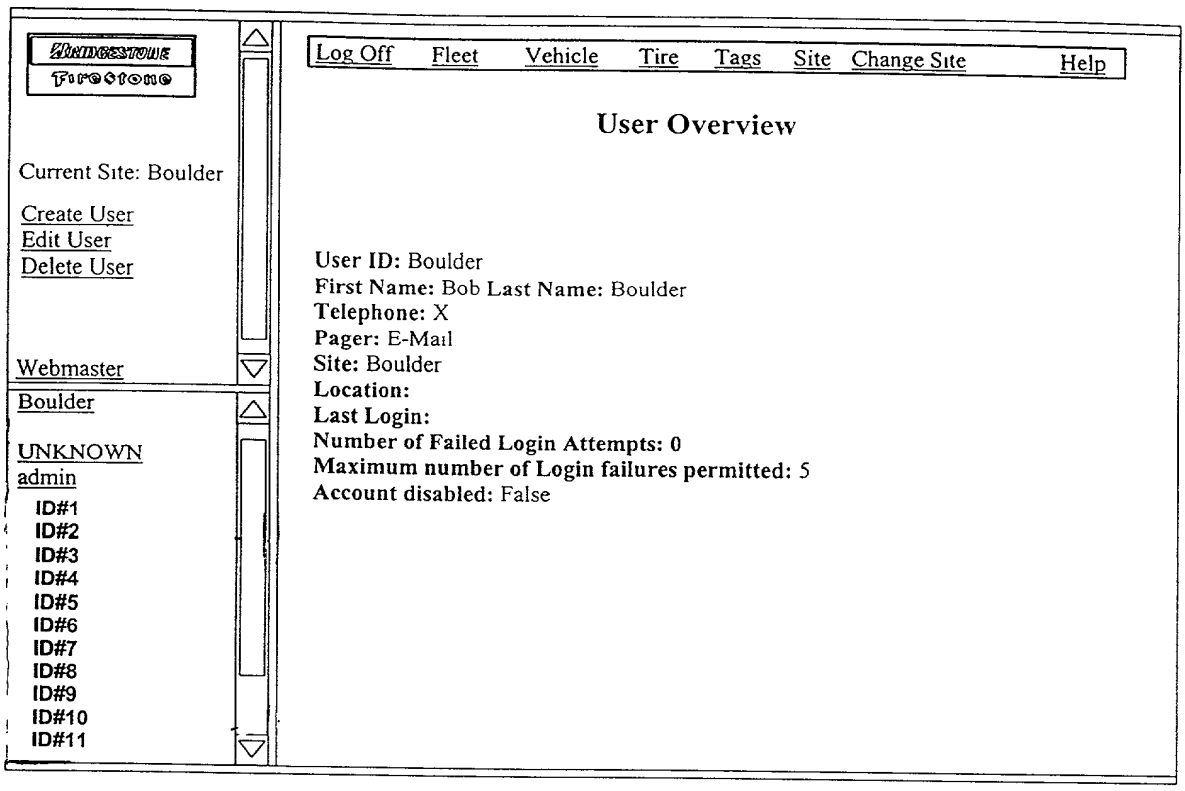

About
Help
Fleet
Vehicle
Tire
Date
Name:
Temp Vehicle
ETMS Dummy Test Vehicle
Manufacturer:
UNKNOWN
Dummy Manufacturer
Model:
Model UNKNOWN
Dummy Model
Status:
ONLINE
OFFLINE
State:
All
Alarm
Cancel
Apply

Fig. 28


About
Help
Fleet
Vehicle
Tire
Date
Name:
fffe00-fffe00-16776704
fffe01-fffe01-16776705
(Brand Number-Tire Serial Number-Tag Serial Number)
Manufacturer:
Dummy Manufacturer
UNKNOWN
Model:
All
Dummy Model Number
Position:
All
UNKNOWN
Size:
All
DummyX40
Status:
All
ONLINE
State:
All
Alarm
Cancel
Apply

# Fig. 29




Bridgestone Firestone
Current Site: Boulder
Create User
Edit User
Delete User
Webmaster
Boulder
UNKNOWN
admin
ID#1
ID#2
ID#3
ID#4
ID#5
ID#6
ID#7
ID#8
ID#9
ID#10
ID#11
Log Off Fleet Vehicle Tire Tags Site Change Site Help
User Overview
User ID: Boulder
First Name: Bob Last Name: Boulder
Telephone: X
Pager: E-Mail
Site: Boulder
Location:
Last Login:
Number of Failed Login Attempts: 0
Maximum number of Login failures permitted: 5
Account disabled: False

# Fig. 30

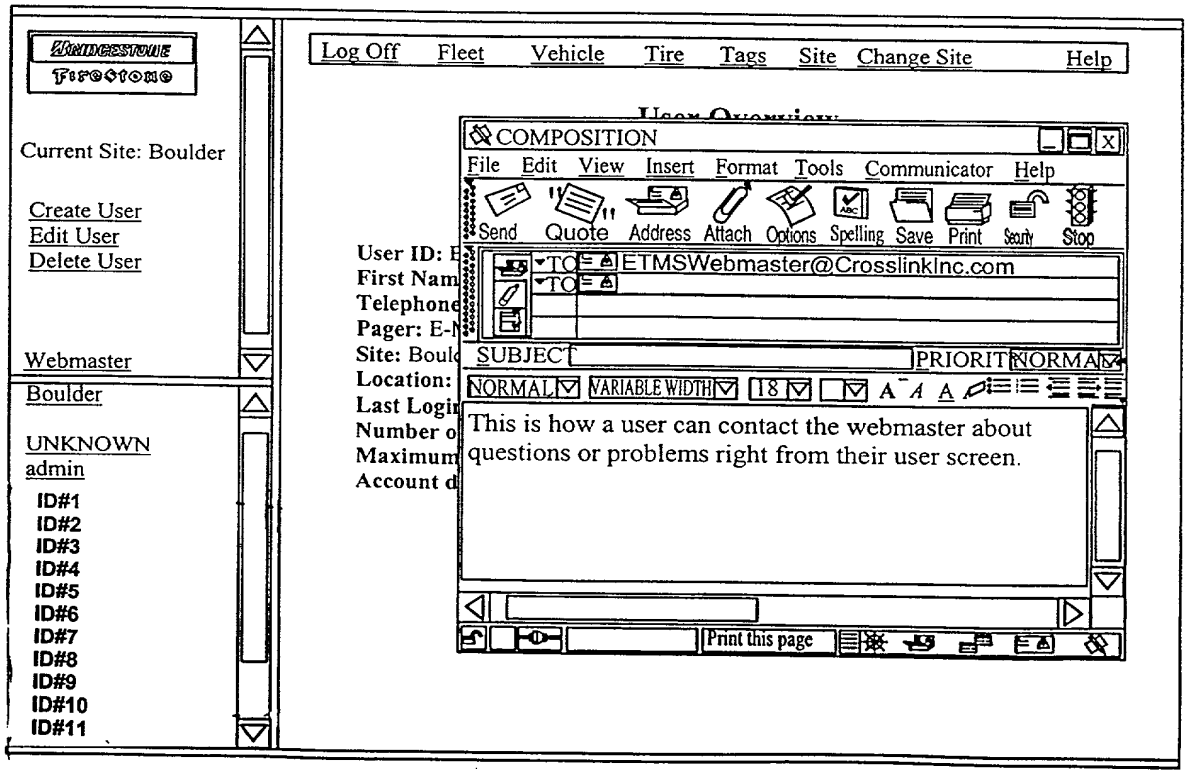

Bridgestone Firestone
Current Site: Boulder
Create User
Edit User
Delete User
Webmaster
Boulder
UNKNOWN
admin
ID#1
ID#2
ID#3
ID#4
ID#5
ID#6
ID#7
ID#8
ID#9
ID#10
ID#11
Log Off Fleet Vehicle Tire Tags Site Change Site Help
COMPOSITION
File Edit View Insert Format Tools Communicator Help
Send Quote Address Attach Options Spelling Save Print Security Stop
TO: ETMSWebmaster@Crosslinkinc.com
SUBJECT
PRIORITY NORMAL
NORMAL VARIABLE WIDTH 18
This is how a user can contact the webmaster about questions or problems right from their user screen.
Print this page

Fig. 31

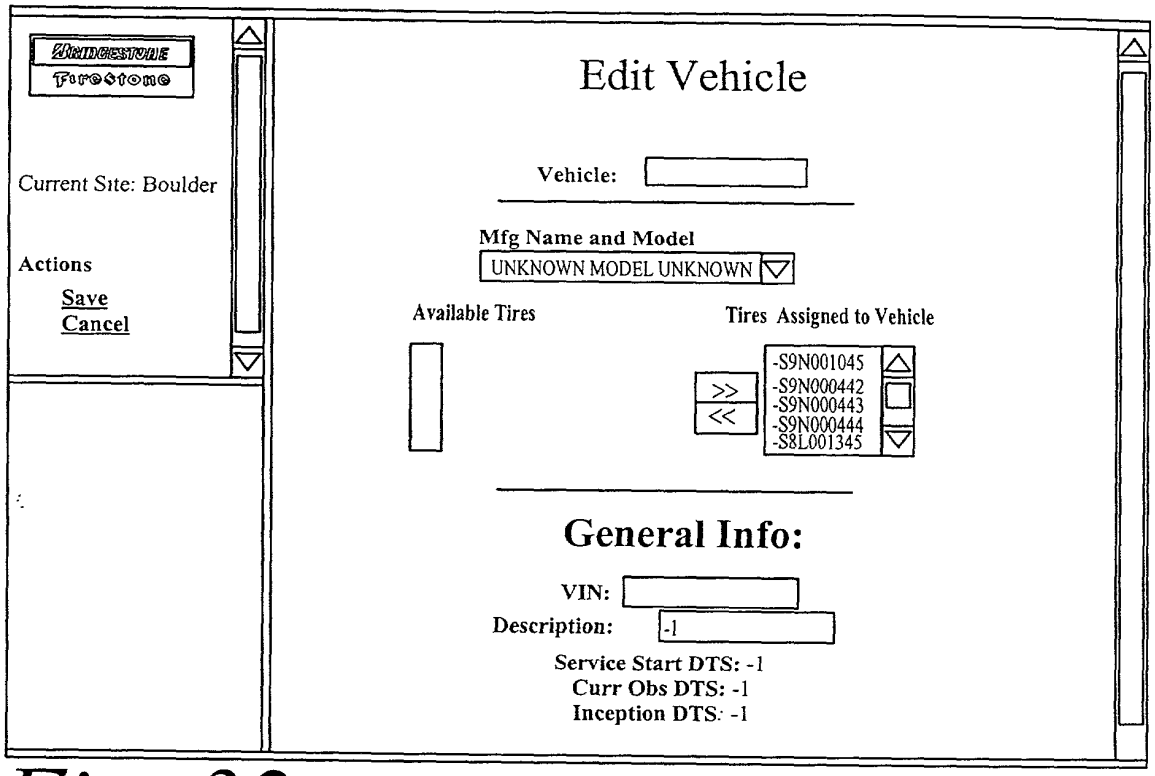

BRIDGESTONE
Firestone
Current Site: Boulder
Actions
Save
Cancel
Edit Vehicle
Vehicle:
Mfg Name and Model
UNKNOWN MODEL UNKNOWN
Available Tires
Tires Assigned to Vehicle
>>
<<
-S9N001045
-S9N000442
-S9N000443
-S9N000444
-S8L001345
General Info:
VIN:
Description:
-1
Service Start DTS: -1
Curr Obs DTS: -1
Inception DTS: -1

Fig. 32

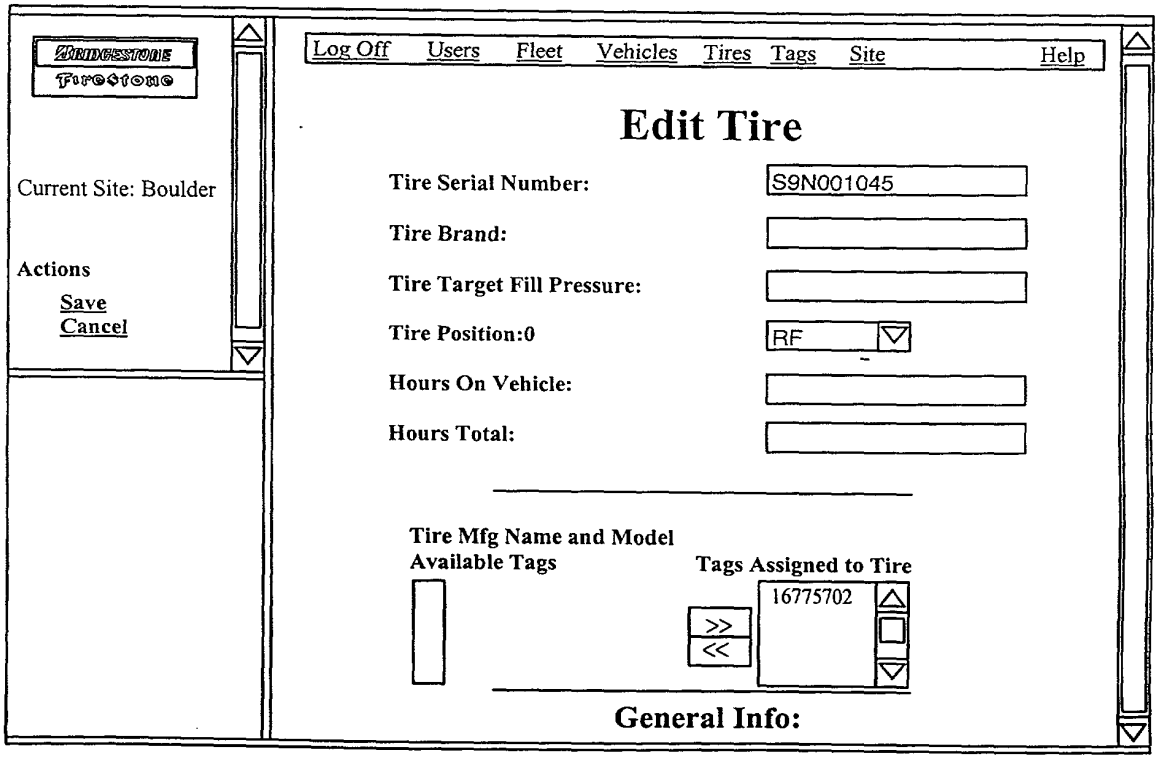

BRIDGESTONE
Firestone
Log Off
Users
Fleet
Vehicles
Tires
Tags
Site
Help
Current Site: Boulder
Actions
Save
Cancel
Edit Tire
Tire Serial Number:
S9N001045
Tire Brand:
Tire Target Fill Pressure:
Tire Position:0
RF
Hours On Vehicle:
Hours Total:
Tire Mfg Name and Model
Available Tags
Tags Assigned to Tire
>>
<<
16775702
General Info:

Fig. 33

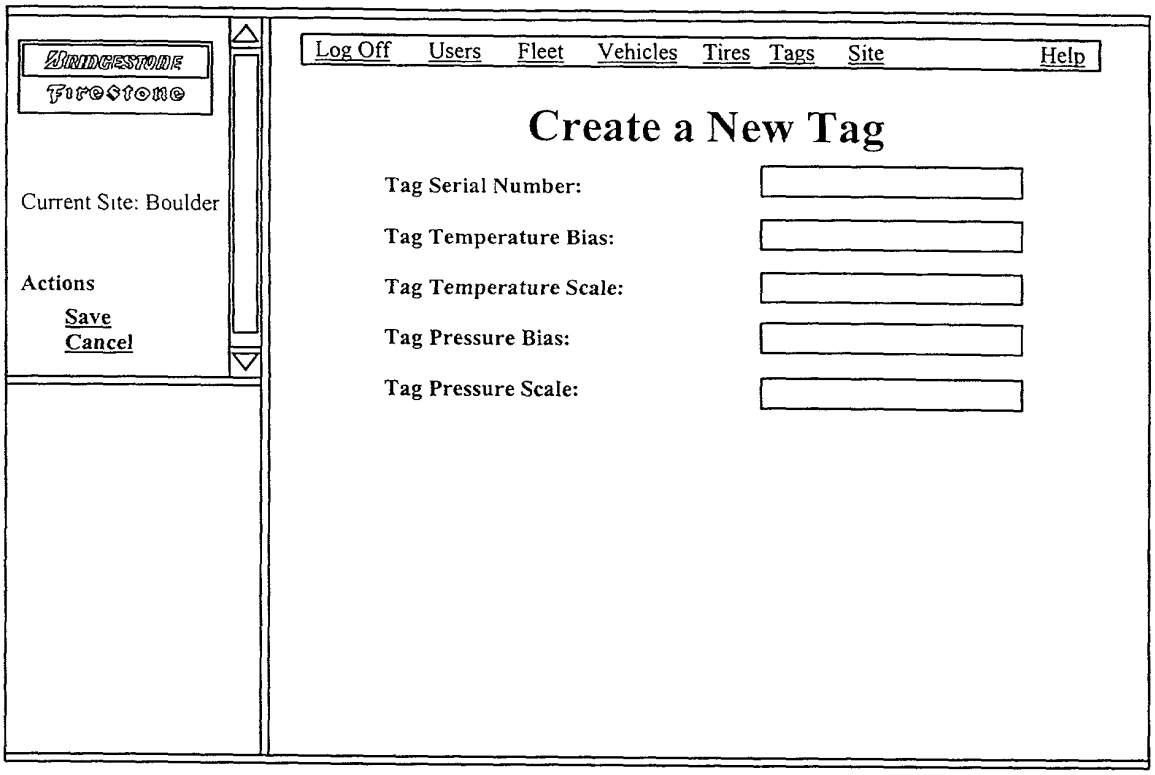
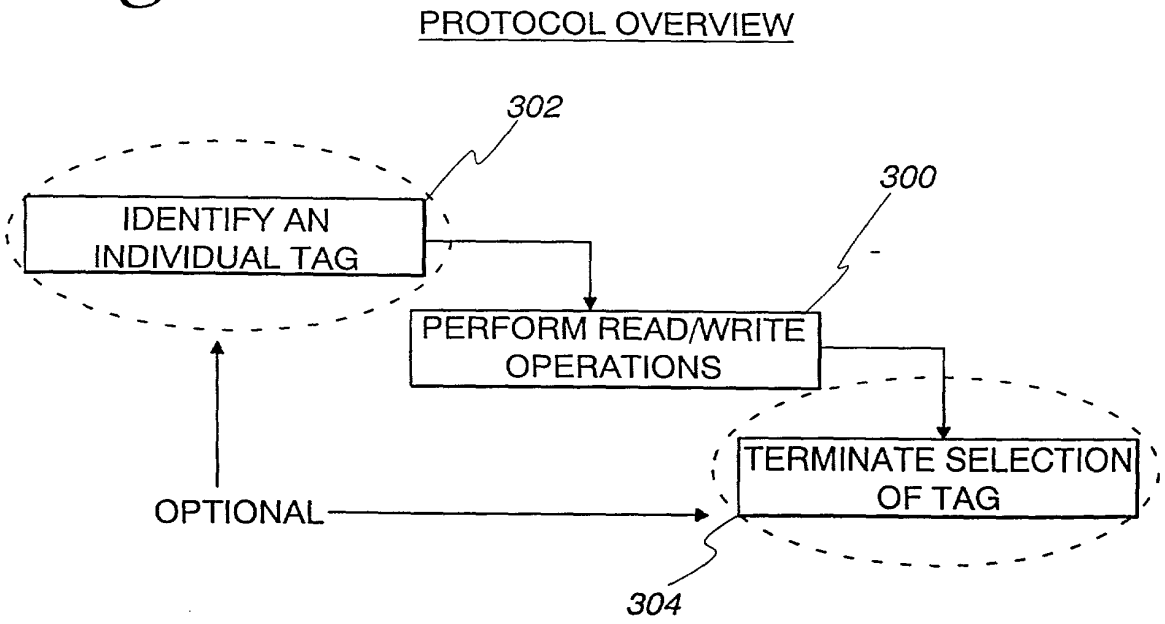
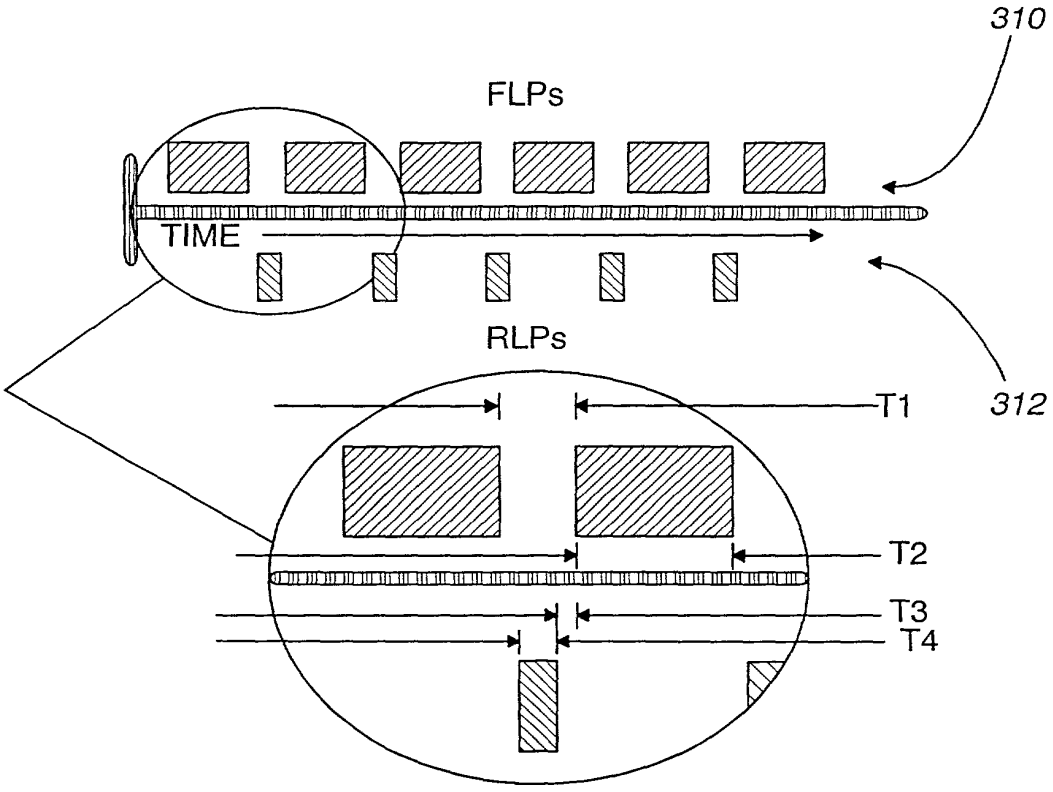

BRIDGESTONE
Firestone
Current Site: Boulder
Actions
Save
Cancel
Log Off
Users
Fleet
Vehicles
Tires
Tags
Site
Help
Create a New Tag
Tag Serial Number:
Tag Temperature Bias:
Tag Temperature Scale:
Tag Pressure Bias:
Tag Pressure Scale:

Fig. 34

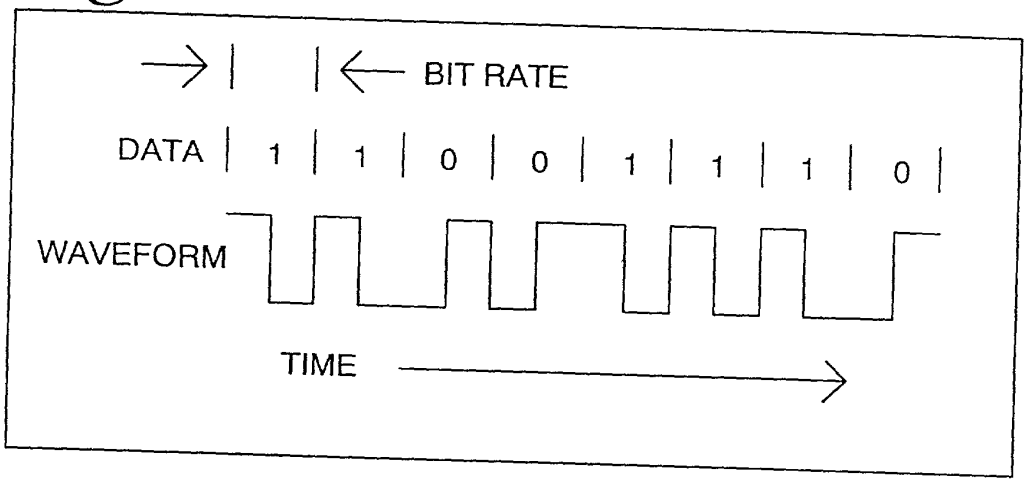

PROTOCOL OVERVIEW
302
300
IDENTIFY AN INDIVIDUAL TAG
PERFORM READ/WRITE OPERATIONS
TERMINATE SELECTION OF TAG
OPTIONAL
304

# *Fig. 35*



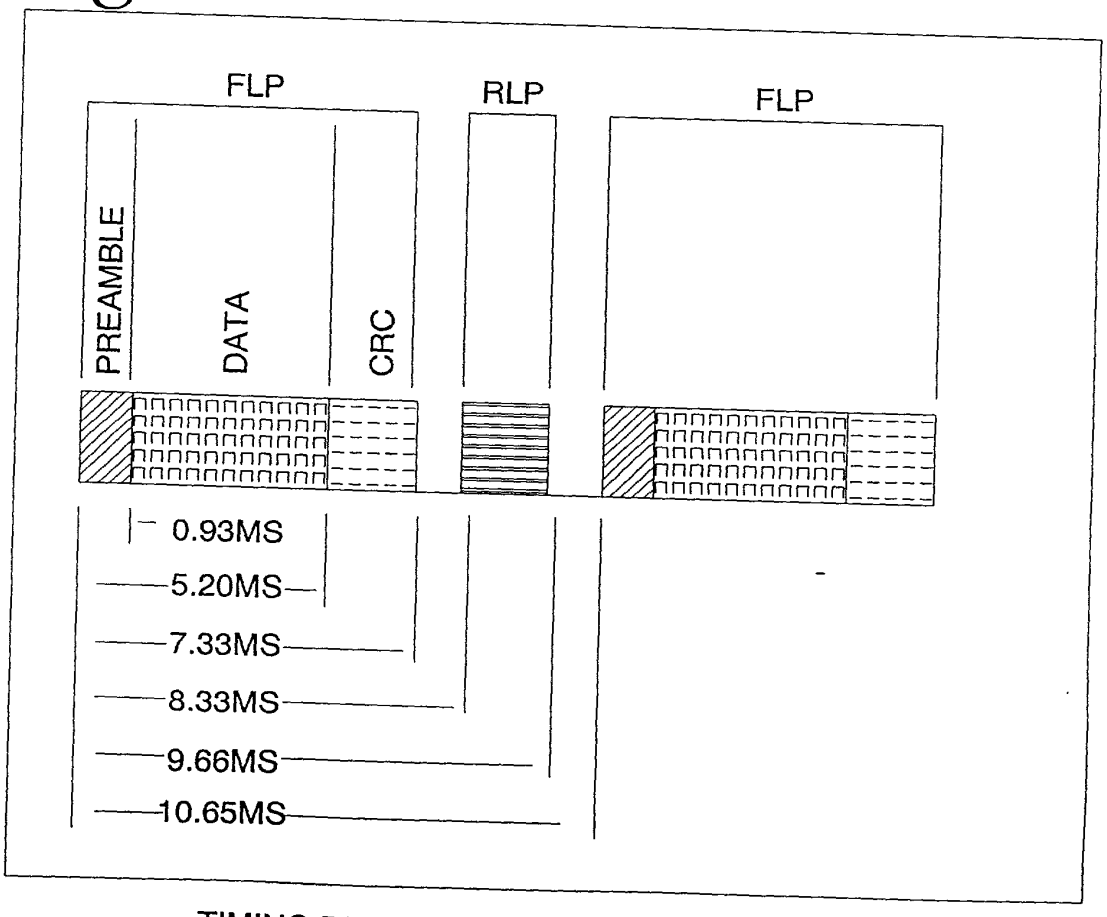

PACKET TIMING

Fig. 36




MANCHESTER ENCODING

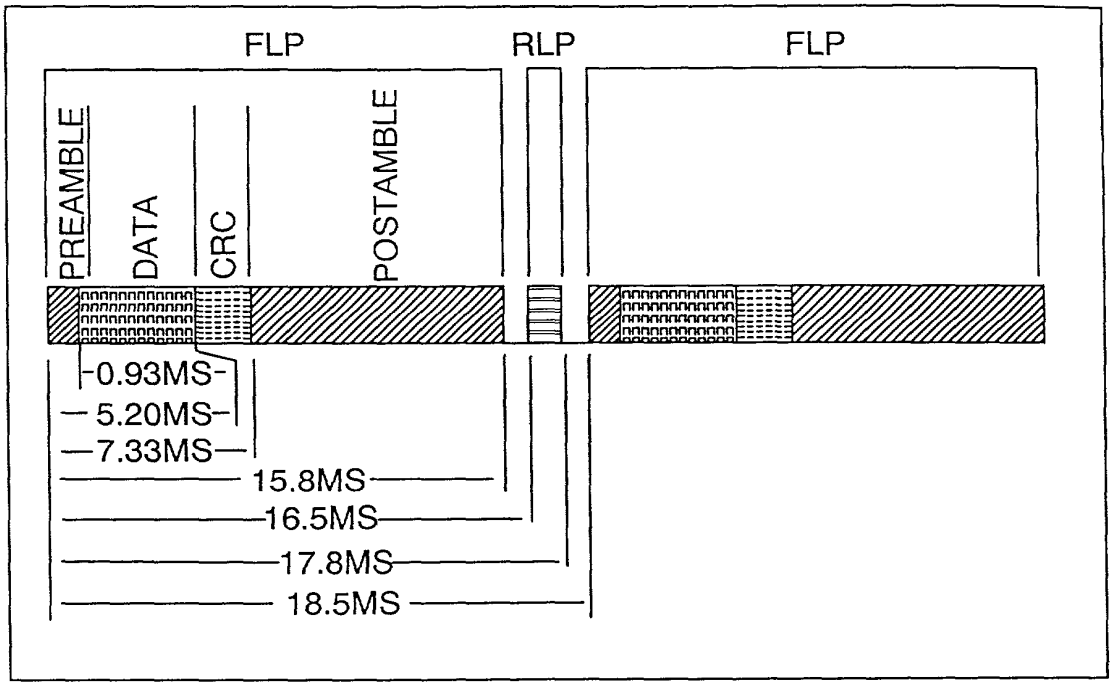
Fig. 37B




TIMING DIAGRAM WITH PREAMBLE & CRC

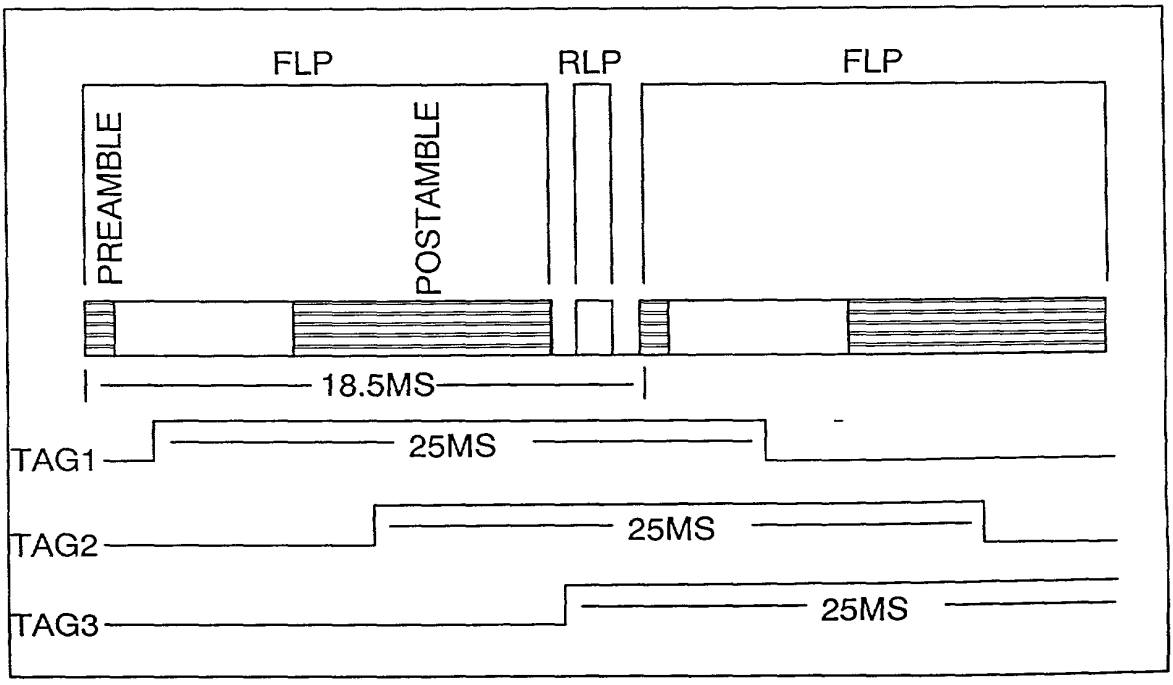
# Fig. 37A






TIMING DIAGRAM WITH PREAMBLE, CRC, POSTAMBLE

# Fig. 37C




TAG RECEIVER WAKEUP

Fig. 38

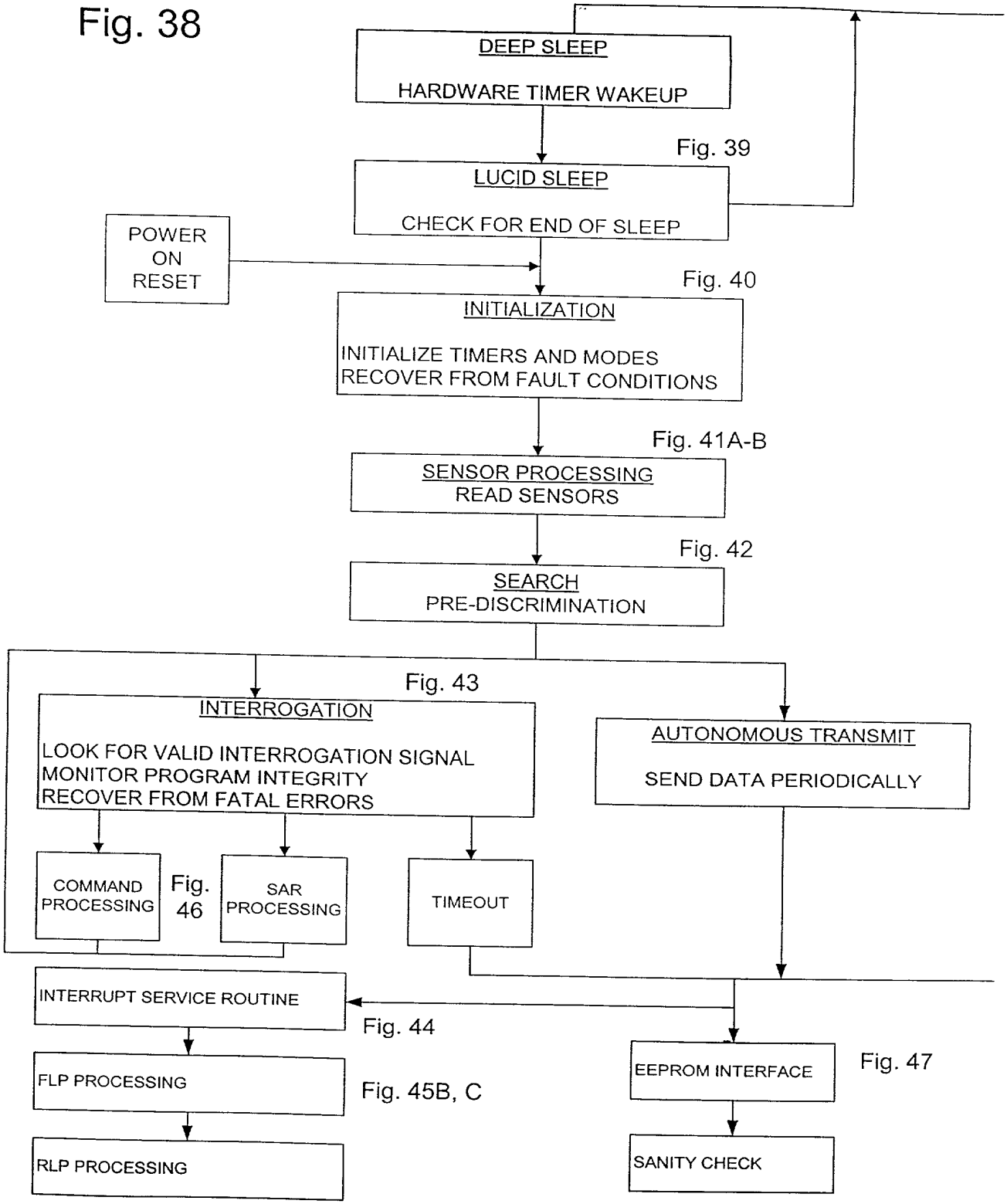



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Fig. 39

# LUCID SLEEP

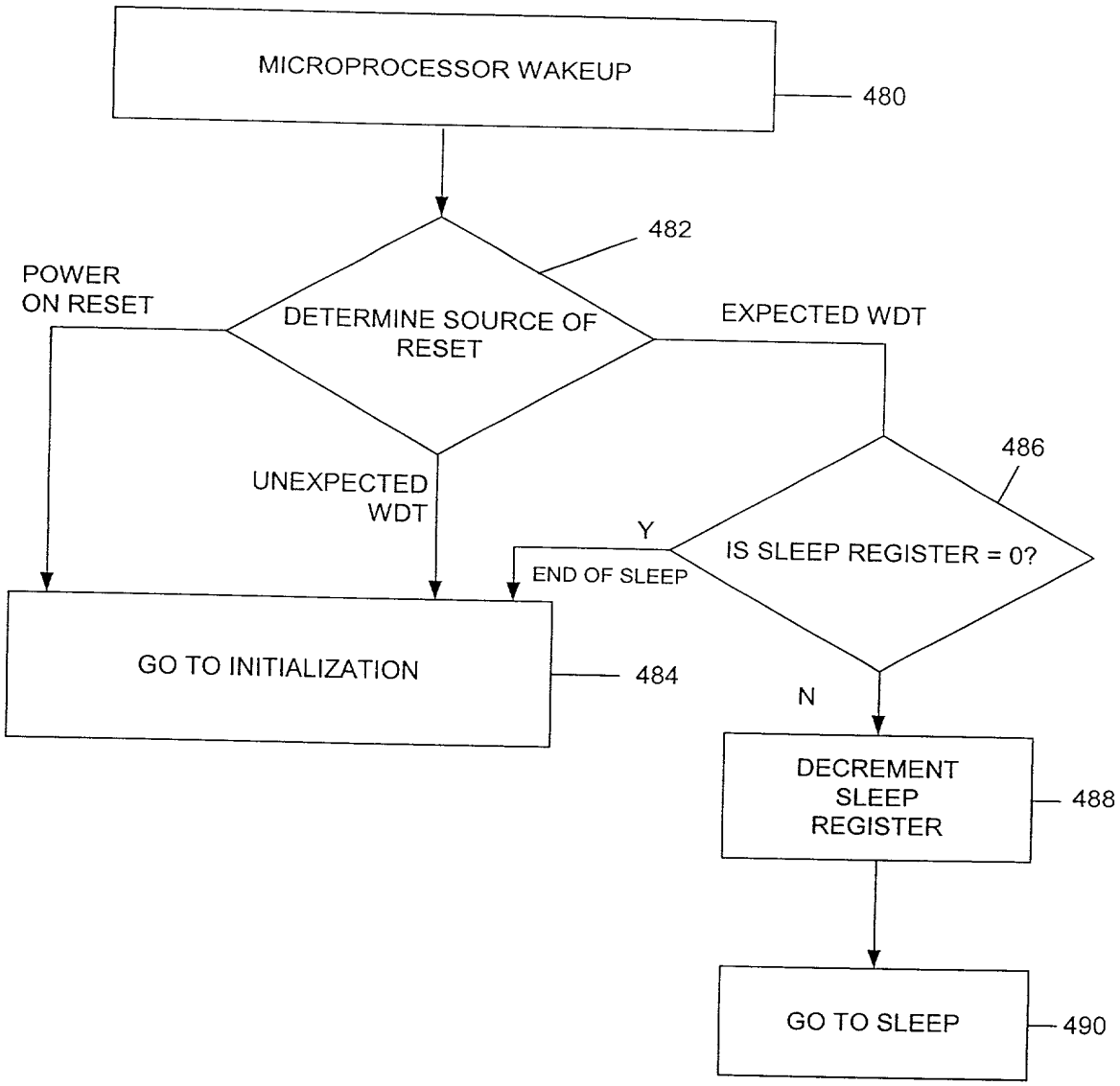

Fig. 40

# INITIALIZATION

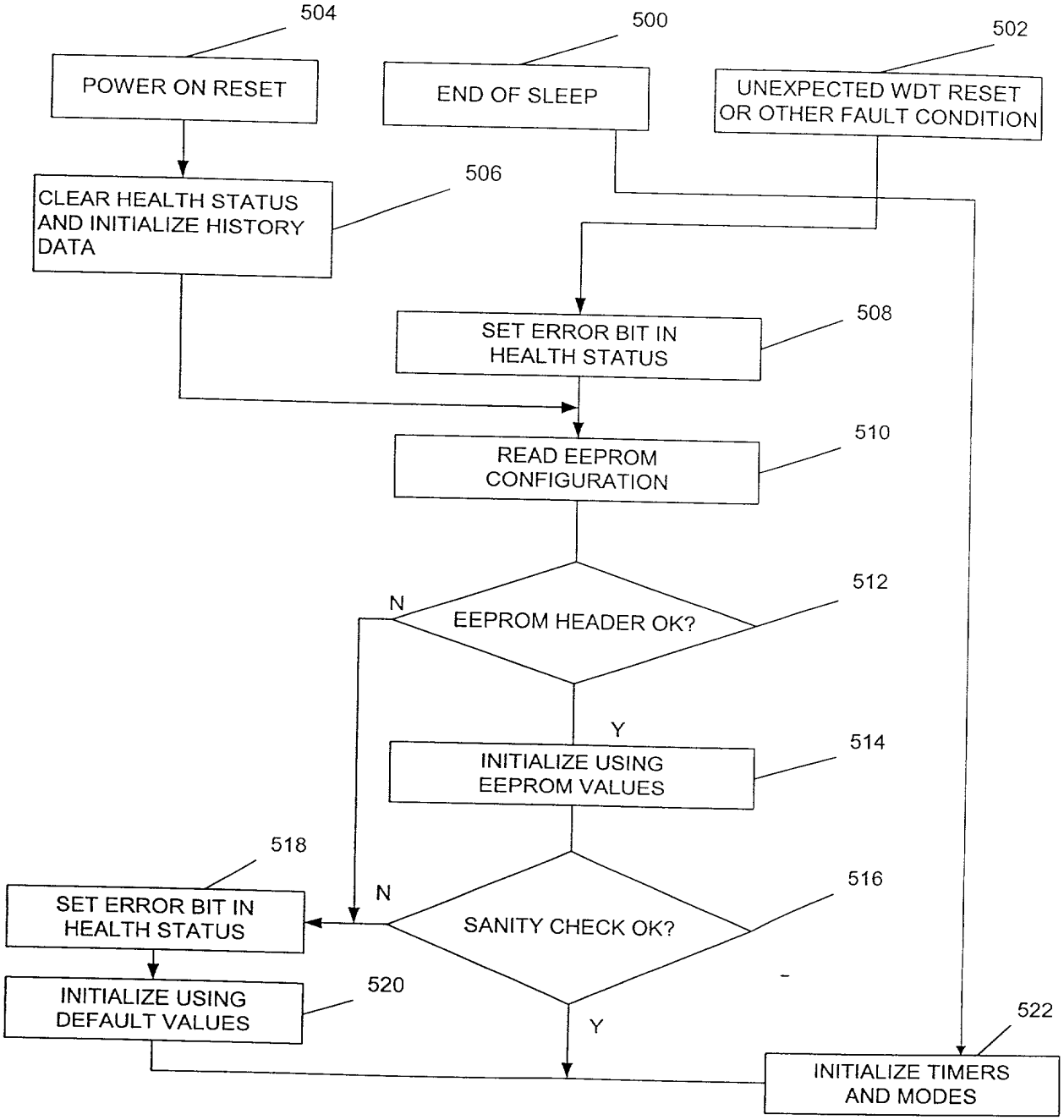

Fig. 41A

# SENSOR PROCESSING

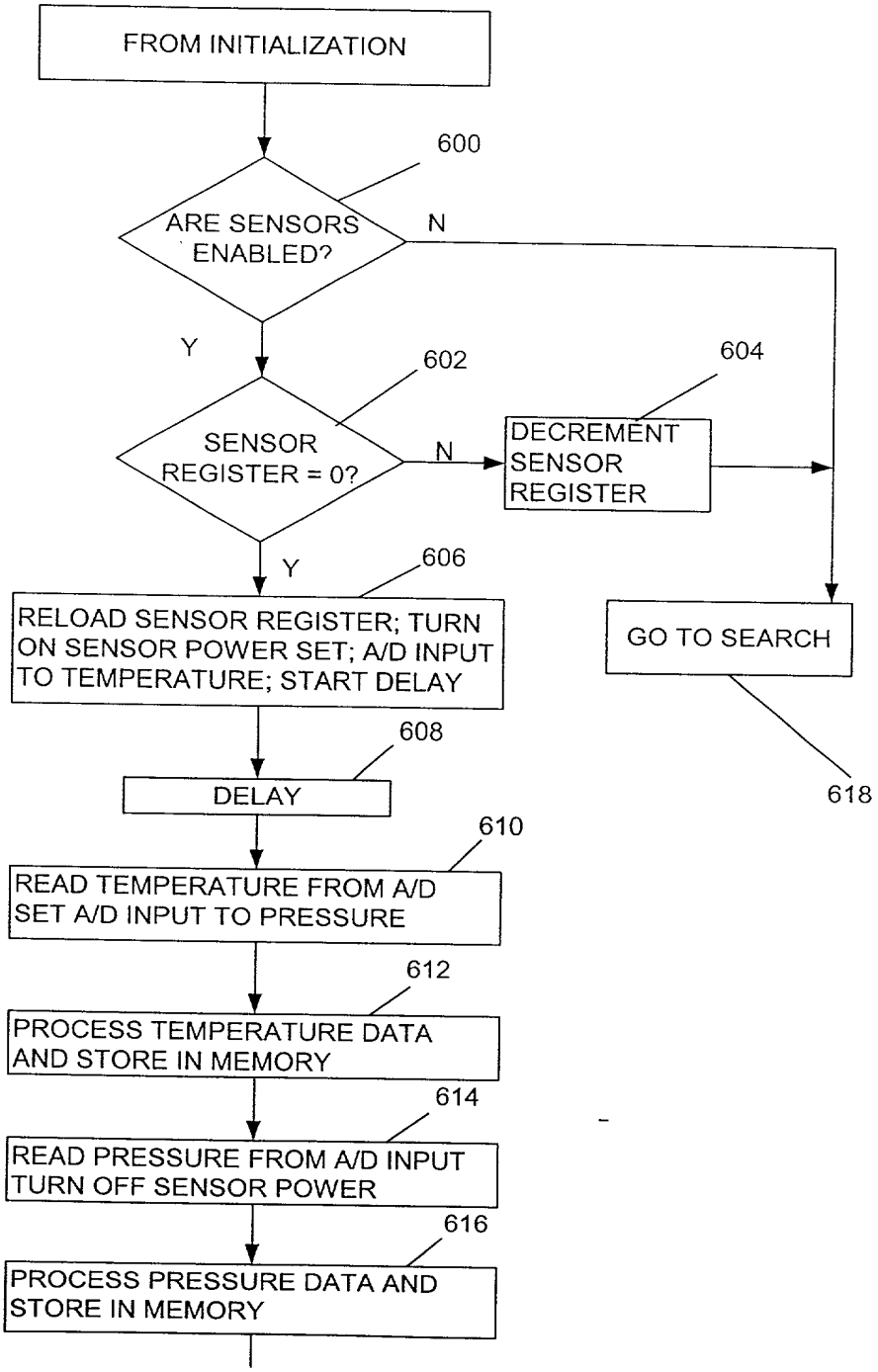

Fig. 41B

# SENSOR PROCESSING

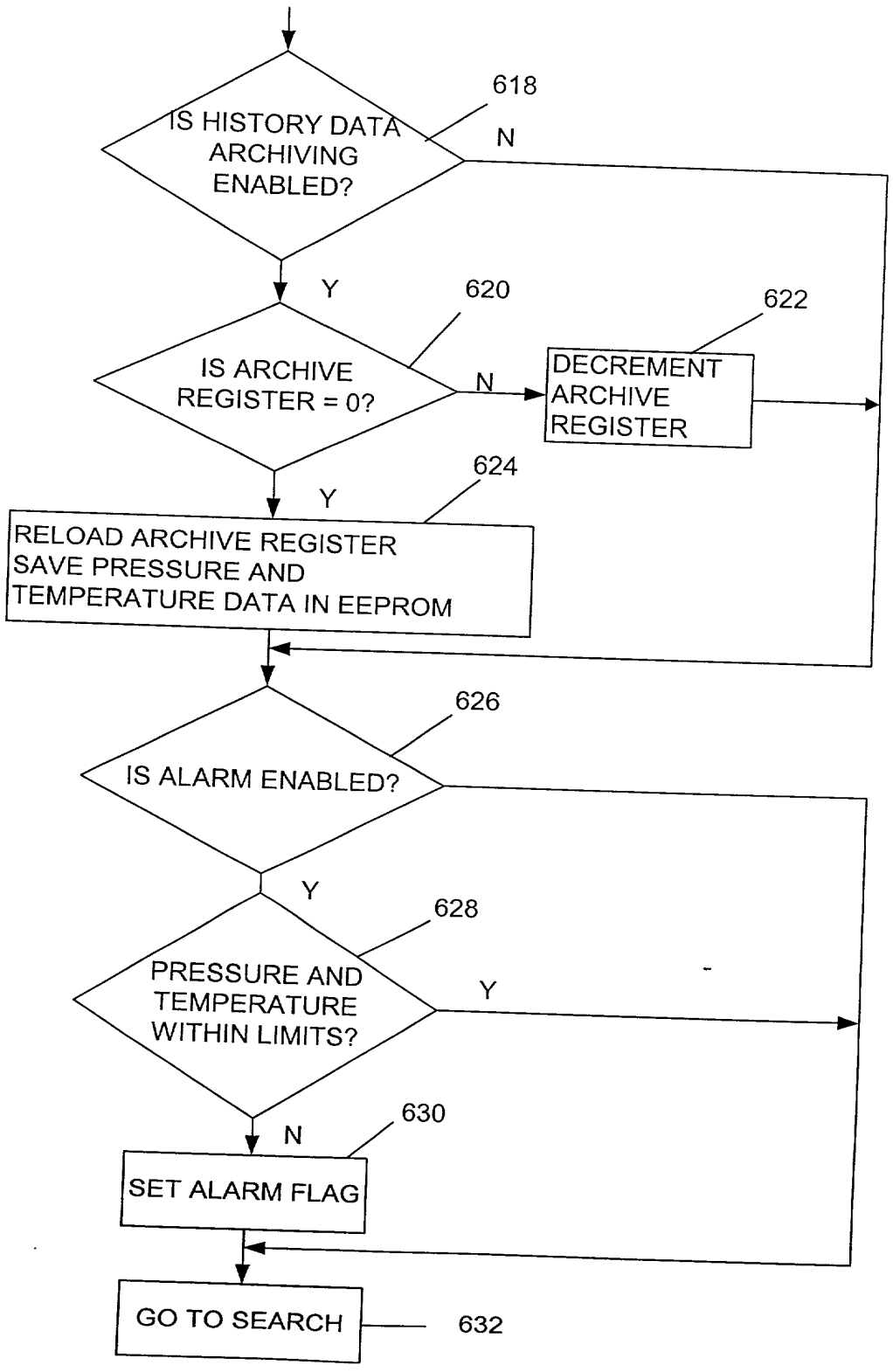

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Fig. 42

SEARCH

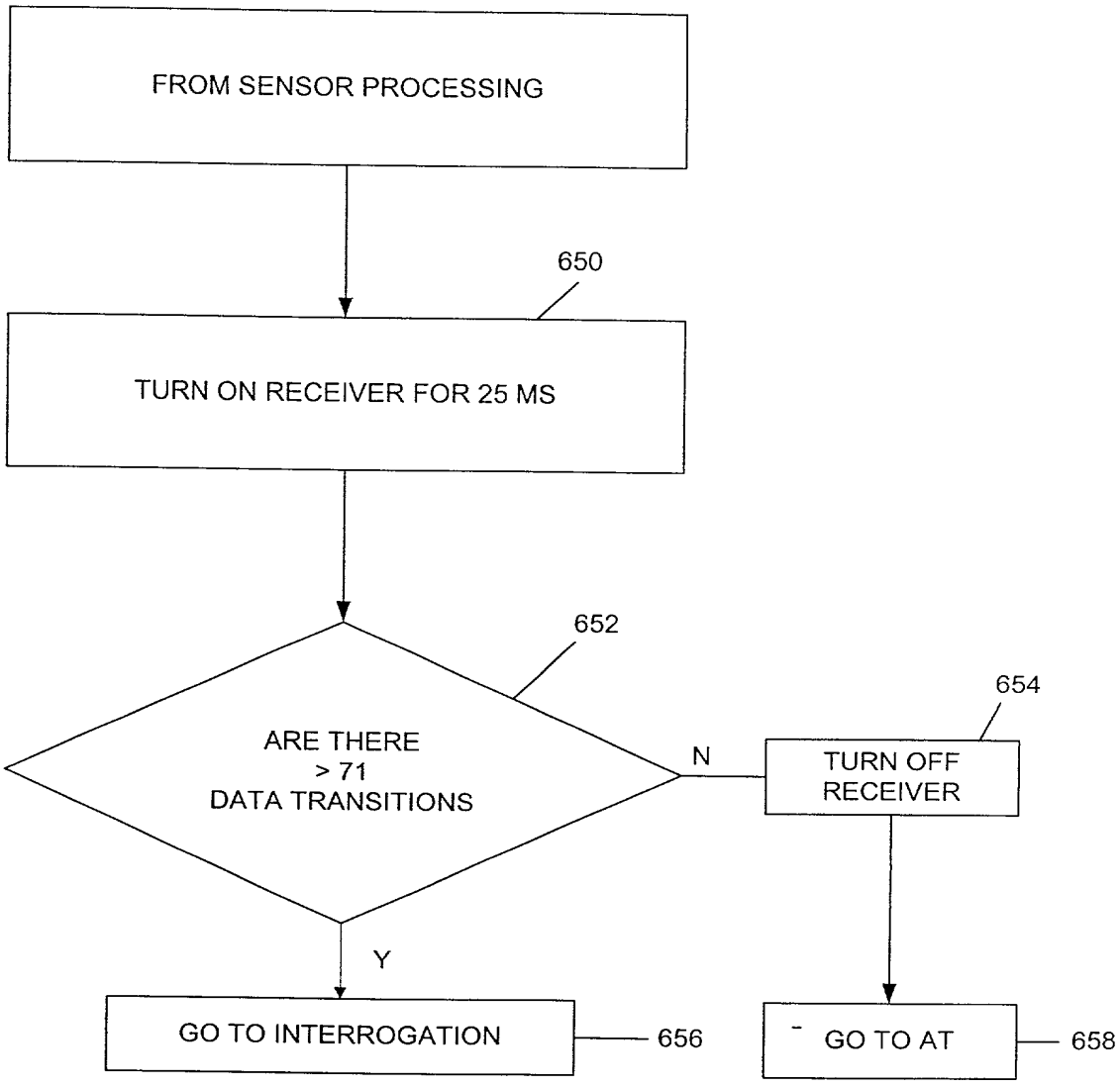

Fig. 43

# INTERROGATION

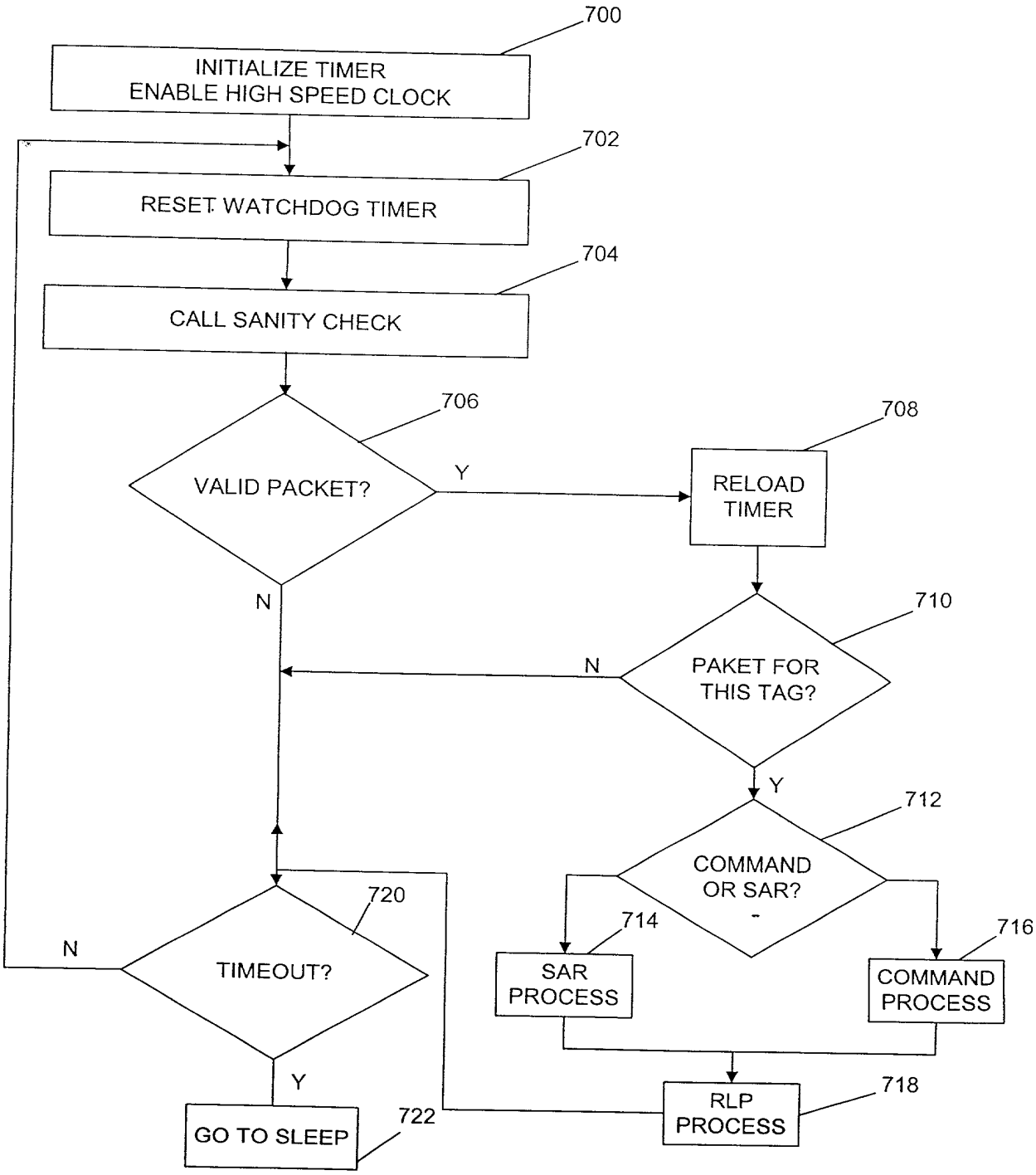

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Fig. 44

# INTERRUPT SERVICE

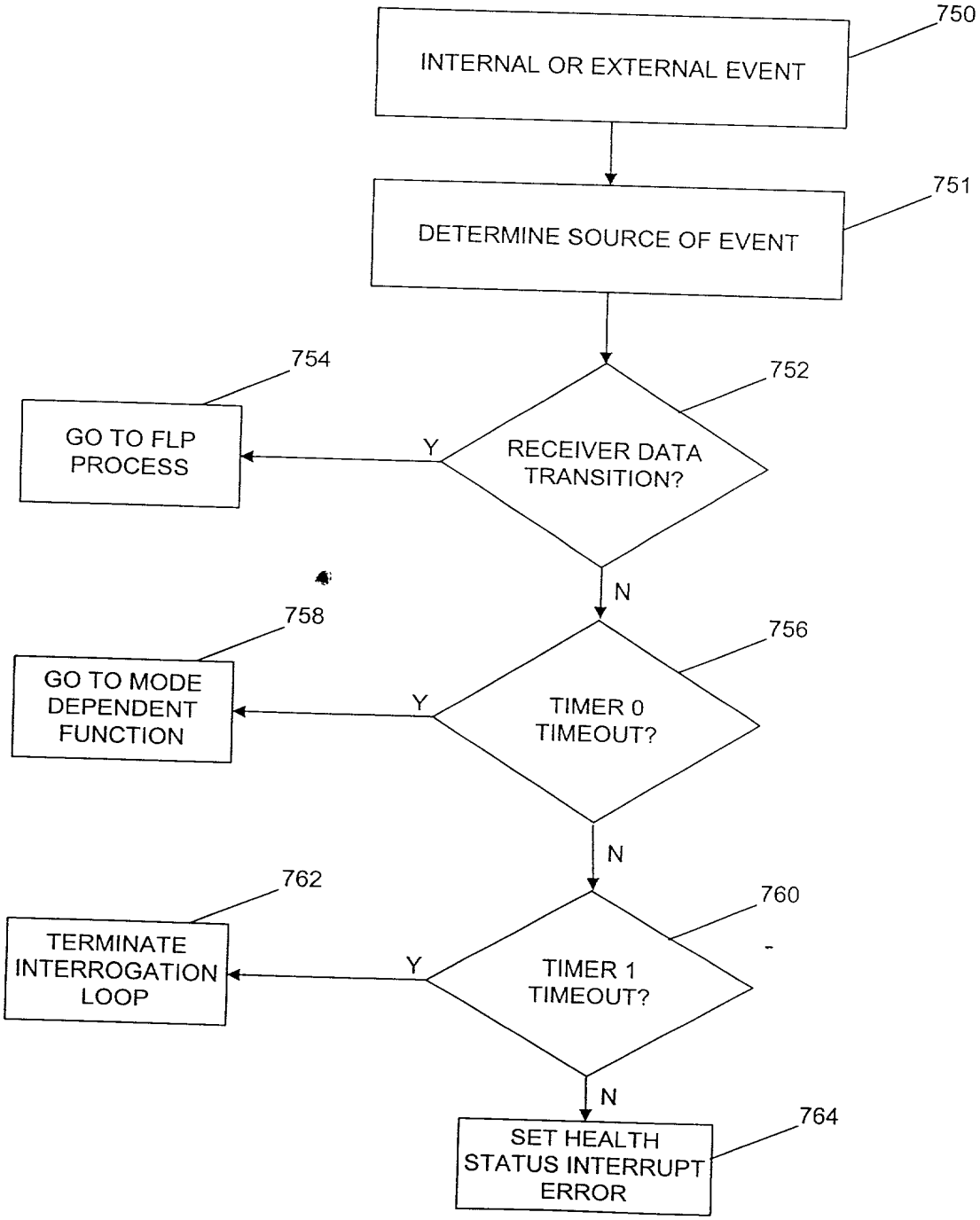


Fig. 45A

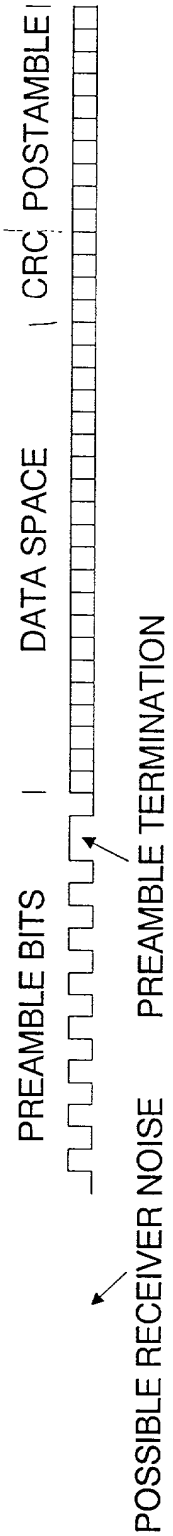

PREAMBLE BITS
DATA SPACE
CRC
POSTAMBLE
PREAMBLE TERMINATION
POSSIBLE RECEIVER NOISE

Fig. 45B

# PACKET PROCESSING (PRE-DISCRIMINATION)

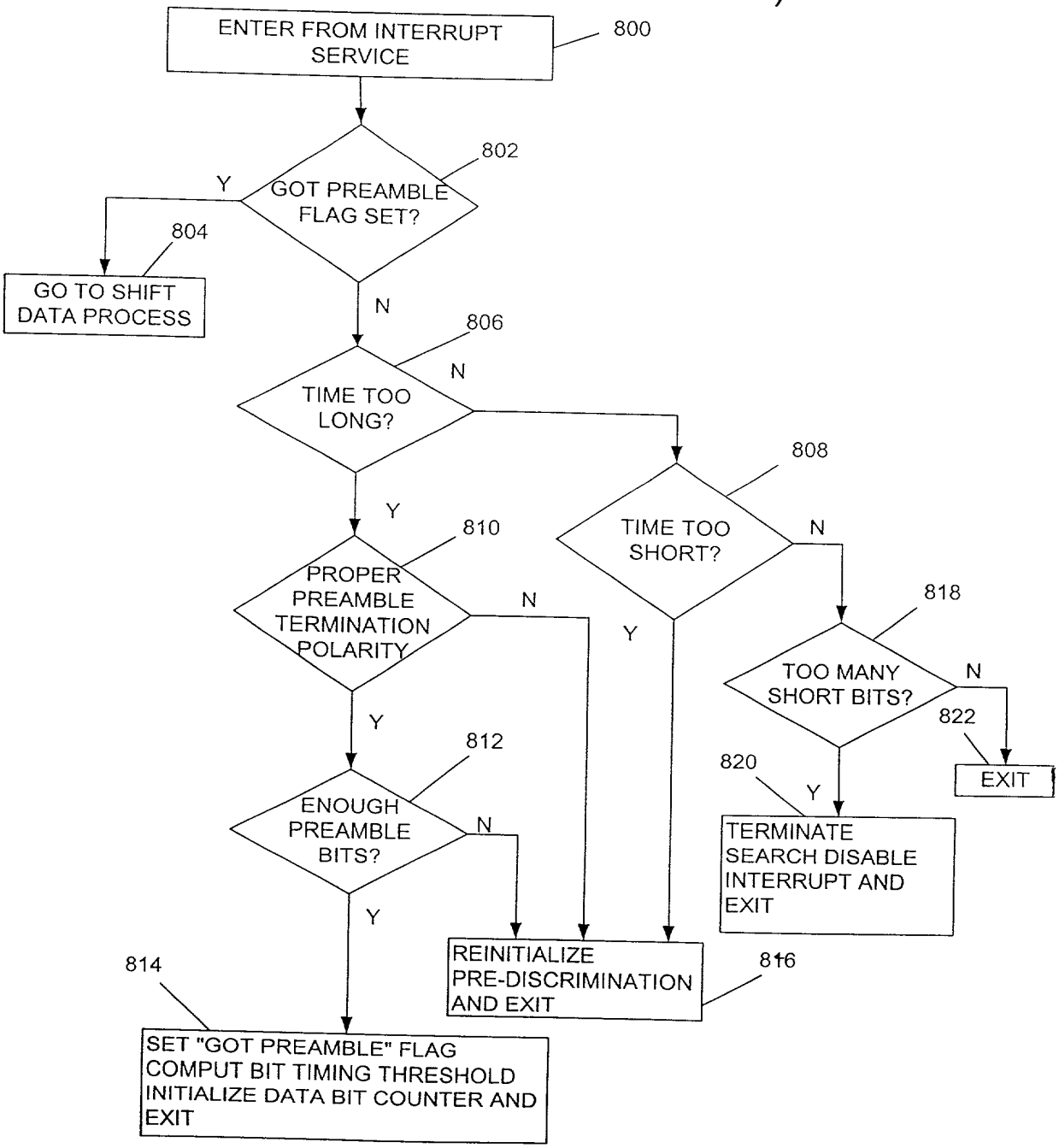


Fig. 45C

PACKET PROCESSING (SHIFT DATA PROCESS)

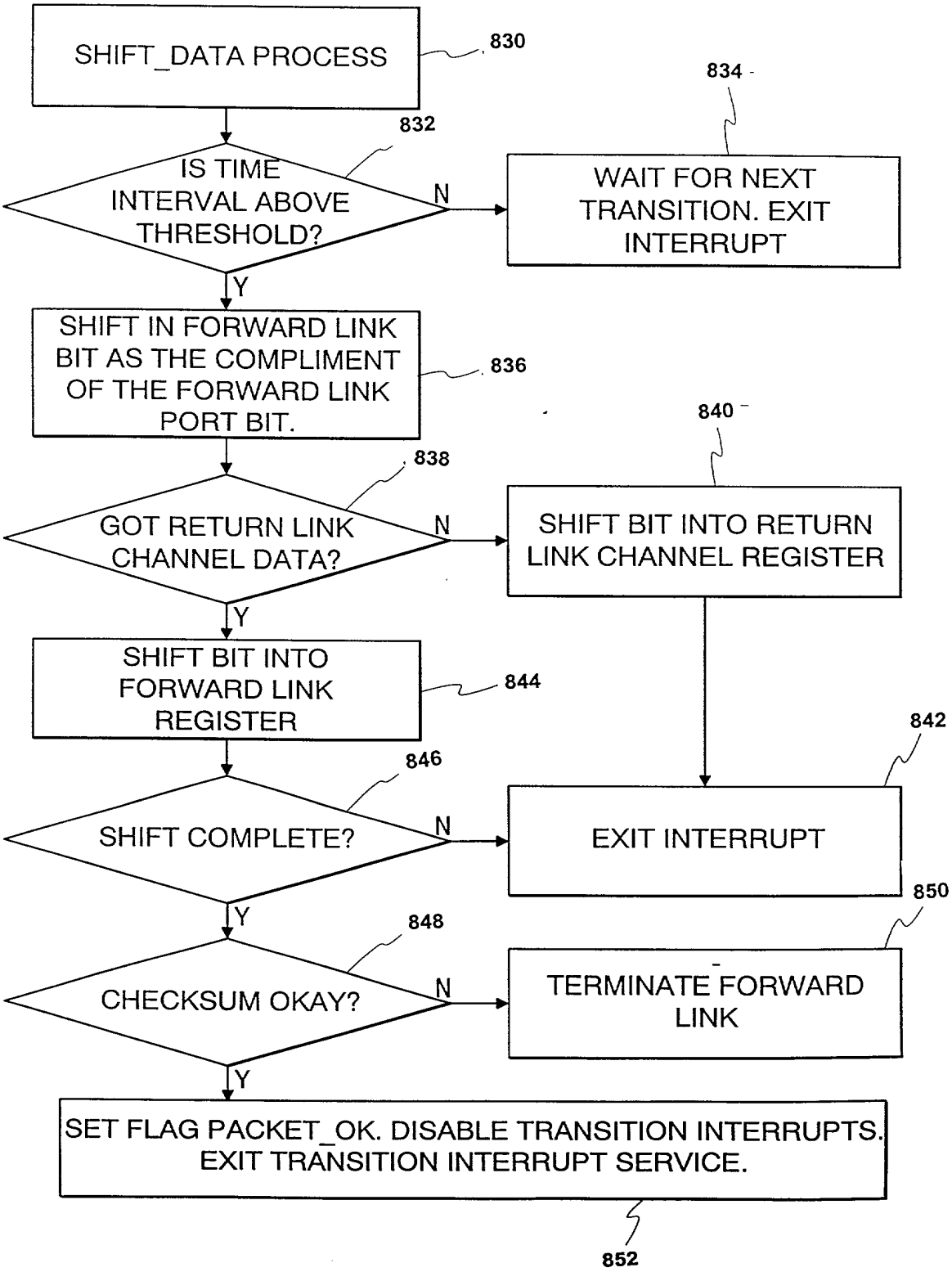
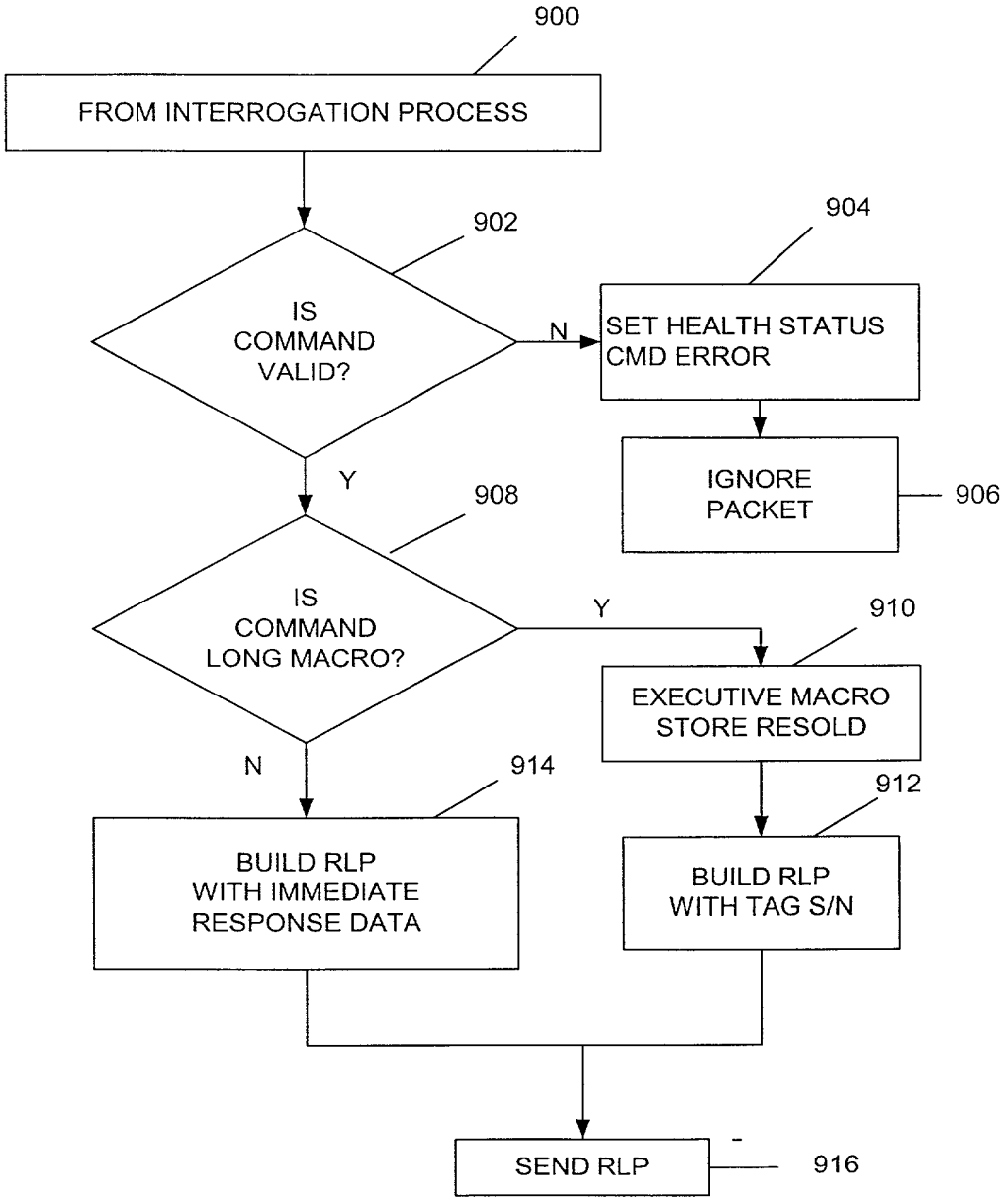
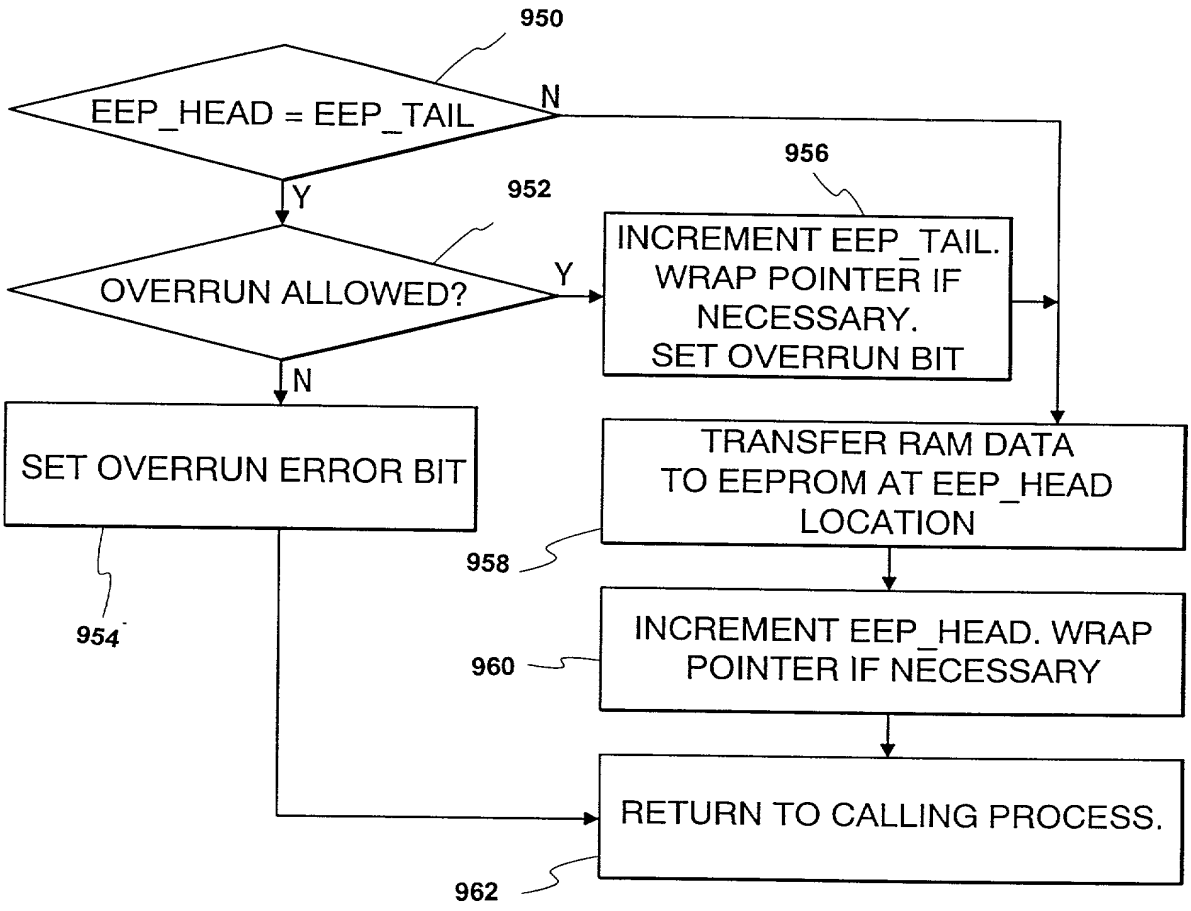


Fig. 46

# COMMAND ROUTINE



# Fig. 47

EEPROM INTERFACE